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CARPENTRY AND BUILDING

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IRON IN MODERN ARCHITECTURE.—STONE STREET ENTRANCE TO THE PRODUCE EXCHANGE, NEW YORK.

George B. Post, Architect.

Iron in Modern Architecture.

It is mainly in city buildings of a business character—buildings which have succeeded demolished structures not suited to present requirements—that the resources of iron for architectural purposes are best illustrated. While iron enters largely into the purely constructive features of these loftier and more substantial erections, it is also made contributory to decorative treatment. None can fail to note the extreme transition that has been experienced from the early structures into which iron entered architecturally, many of them having no higher character than might belong to a bonded warehouse, an iron foundry or an engine factory, to modern buildings, which, despite the use of a material that has sometimes been despised, are both imposing and beautiful. In the structures into which iron now enters as a facing we witness, ordinarily, carefully-designed construction, with judicious decoration, conforming to some pronounced style, this style coalescing to some extent with other portions of the facade, in which different materials are used. Iron has in many respects the advantage of other materials in the facility with which the effect may be changed by new combinations of form. The Stewart iron building, on Broadway, for example, which has the credit of being the largest iron building in the world, and which follows the columnar and arched style of construction, presents, notwithstanding a monotonous repetition of forms, a somewhat stately appearance. Some of the earlier iron business structures had a spider-like lightness of construction which reduced their dignity; at the same time they answered the purpose of furnishing abundant light to the floors, which is not the case with some of the recent stone and brick edifices. Two of the old city market houses, Clinton and Thompson, are of iron, and succeeded to wooden structures. The new Washington Market, which is of iron, owing to its extended area offered a fine opportunity for the exhibition of roofwork, dispensing as iron does with much of the pillared support requisite for wooden roofs. The moderate hight of the structure, which is surrounded by an arcade of iron and glass, is not sufficient to allow of any bold and striking effects. The decorations, apart from the arched windows and entrances, consist of *bas relief* panel moldings of flower and fruit, with projecting heads of animals above. Iron and terra-cotta have been happily combined in this structure, concerning which we may have more to say at some future time.

Iron balustrades for stairways date far back, but at first they were mainly plain bars, with no recommendation but utility, whereas now, made in arabesque and other open patterns, they add greatly to interior structural beauty. Architects have turned handsome balustrade designs to good account in bordering successive landings in the spacious and deep wells that furnish interior light to some of our city buildings. Coated with color and picked out with gilt, the designs are sometimes rich and intricate, like interlaced ornamentation; in others they may be likened to a succession of central bosses, from which radiate curved and spiral forms; occasionally they are of a certain arabesque style, with graceful curvilinear lines set between slender shafts. Much of the iron railing introduced into offices for purposes of partition is of an exceedingly rich character without being overcrowded with details. No small amount of taste has been developed in the front railings of buildings; these are in great variety. An excellent feature, comporting well with the dignity of massive business edifices, such as the Mills and Washington buildings, New York City, is in massive iron gateways treated in true Romanesque style, with highly characteristic patterns. In the Mills building especially a fine scenic effect is thus secured, the vestibule, its central steps and arched and pillared landing and artistically treated walls being brought into view.

A somewhat picturesque application of iron is that of iron lanterns in the center of ceilings of rooms, consisting of a series of frames elevated above or into the ceilings, and which are filled with stained or beveled glass. Iron skylight frames, many very artistically constructed, have come into general use, and they attest their superiority to wood. Iron columns and pilasters introduced for purposes of support into buildings of any pretension, and where decoration is sought, are no longer plain circular shafts surmounted by a riveted plate to serve as an abacus; in their place we have fluted shafts, often lightly ornamented with figures in *bas relief*, or rich paneled sides for square columns, with tastefully designed capitals, particularly in grouped leaf forms in which projecting edges and deep sinkings contrast with convex forms, grace and lightness being the chief characteristics aimed at.

The increasing costliness of other building materials has somewhat favored the use of iron, but it owes still more to the scale on which business structures and apartment houses are now erected, necessitating strong supports. Although iron is not strictly fireproof, the incasing of pillars and other structural portions of a building with fire-brick or terra-cotta tiles assures, as far as this provision goes, comparative immunity from destruction by fire or heat. The spanning of ceilings with iron girders that protrude so as to panel the surface, dividing the ceiling from side to side, is made to produce bold and fine effects, color and moldings lending their aid. A striking instance of this treatment is in the principal room of the Mutual Life Insurance building, this city. The iron pillars that support the girders, and which are surrounded by fire-brick, are coated with scagliola, and, with their gilded capitals, present a striking architectural feature. The fashion that set in many years since for iron fronts and cornices to Broadway stores led to much meretricious work, including in many instances an excess of ornamentation in moldings of an elaborate description, but instances now abound of consistent and genuine styles of treatment of store fronts. When iron fronts first came in, in response to a public demand, architects were at a loss how to deal with the material, and had to place themselves very much in the hands of founders, and by no stretch of artistic courtesy could much of the molding then lavished on friezes, pilasters, panels and cornices be designated as ornamental. All this is at present very happily changed. Iron is now understood by architects and founders alike, and results are being produced which will stand the severest scrutiny.

A good proportion of the iron ornamentation appearing on panels, cornices, architraves, capitals of columns and the spandrils of arches in the work of the present day is attached by rivets, instead of being cast with the surfaces they cover. In *bas reliefs*, all the sharpness and precision of outline that can be desired is to be met with. The filling in of the upper sides of windows with open ironwork is a lately introduced decoration in lofty and massive structures, so also the attaching of iron ornaments in bar and spiral

Iron Portico on the Kemble Building, New York, Whitehall Street Front. Joseph M. Dunn, Architect.

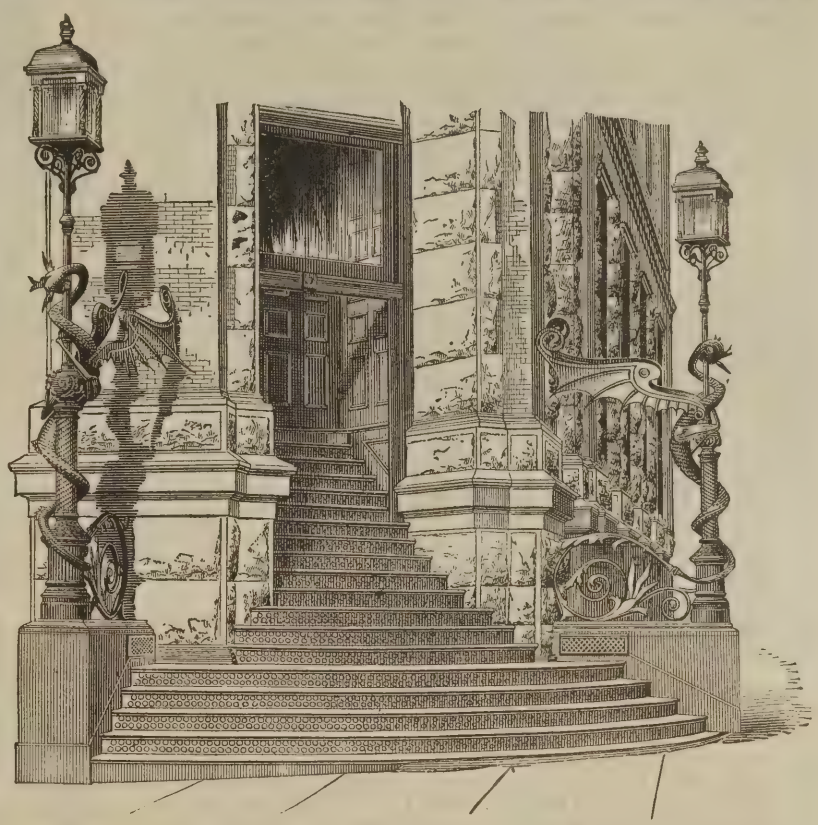
form against the face of brick portions of a facade, with projected spear-like or twisted stems, some of which bear on their extremities conventionalized flowers. Iron balconies, though by no means so generally introduced into facades as in former times, are now more decidedly ornamental, showing in their general forms contrasts of curvilinear and straight lines, and leaf and flower decorations. What may be affirmed of other building materials holds good in iron architecture, namely, that, if proportions are good and the evidences of thought can be traced through the design, the effect will be generally pleasing and satisfactory. A certain amount of symmetry and refinement is indispensable. A design and a construction that proclaims the fact that the mechanical has overruled the artistic elements can never be productive of that expression of beauty which is the aim of architectural art.

In these general remarks concerning the present use of iron in architecture we have not stopped to distinguish between cast iron and wrought iron, nor between the productions of the smith and those of the sheet-metal worker. All varieties of ironwork at the present time are made in better style and of higher quality, to say nothing of artistic excellence, than ever before. The limitations as well as the utility of each variety of the material are known and realized, and it is seldom in the best modern work that we find parts made in cast iron that would have been better done if executed in wrought iron, nor do we so frequently of late as formerly find light sheet iron used where a shell of cast iron would be better. There seems to be judicious discrimination exercised by modern architects, and the several varieties of the material are combined and used in a way to obtain the very best results in all respects. Not only is it true that wrought and cast iron are combined for the purpose of obtaining the best construction and the finest effect, but it is also to be observed that terra-cotta is now used in combination with ironwork in a way to produce effects and secure a character of construction that would be impossible to obtain with either material alone. Modern city architecture, particularly that of New York City, is characterized by judicious combinations of various building materials. We no longer have distinctively iron buildings, nor stone buildings, nor yet brick buildings. But the best structures show a happy blending of brick and stone and iron. An example in point is afforded by the illustration on the first page, which shows the Stone street entrance to the New York Produce Exchange. The lower portion of the building is stone. Above this is brick. The arch of the opening, the spandrels and the cornice above them, in which the name occurs, are of terra-cotta. The gate is of iron, which has been wrought in such a manner, and so twisted and combined at the hands of modern designers and mechanics, that those ancient art workmen to whom the teachers are wont to go for their choicest examples may well turn in their graves for envy.

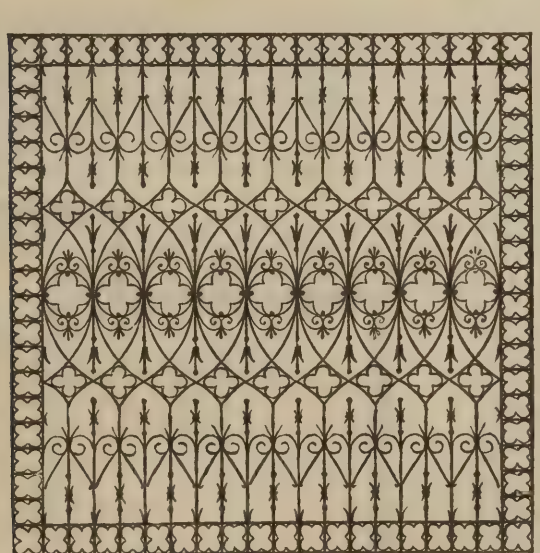
Our subject is a large one. To go into it analytically and to illustrate it step by step would require a series of volumes rather than the space of a magazine article. The most we are able to do is to present an outline, with a few reflections that the different allusions suggest. Our illustrations are characteristic, and yet they have no very special bearing on any particular portion of our remarks. The engraving on the opposite page shows an iron portico which has been recently erected on the Whitehall street front of what is known as the Kemble building, in this city. It illustrates the utility of cast-iron work, where no other material is employed in combination with it, in a very satisfactory manner. The plinths on which the columns stand are of stone, while all above is of iron. The forms which the architect has employed are well adapted to the material used, and yet they are so similar to those heretofore used in stone that the mind of the observer is not impressed with a striking innovation. The general effect has been greatly enhanced by judicious painting and color effects.

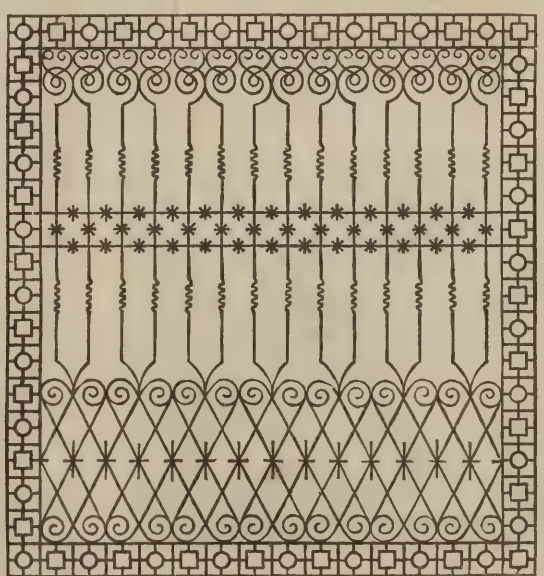
The illustrations at the bottom of this page show some window guards used in one of the celebrated Vanderbilt residences, in this city. Work of this kind is very commonly done in cast iron, but in this instance wrought iron has been employed, and the workmanship is so fine that it may be termed artistic. The most painstaking care has been expended on all the details of this work, which, from its character, can be but poorly indicated in so small engravings. In the final finish the parts have been painted and bronzed, receiving at the hands of the decorator a treatment entirely appropriate to the material, and one which, at the same time, increases the real beauty of the work.

The engravings printed at the top of page



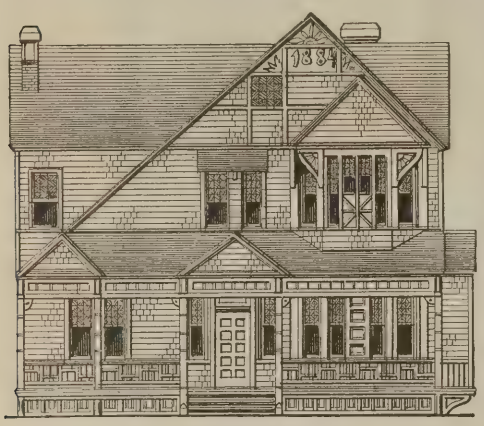
Entrance to Washington Building, Broadway and Battery Place, New York. Edward H. Kendall, Architect.





Window Guards in One of the Vanderbilt Residences, Fifth Avenue, New York. Jno. B. Snook, Architect.

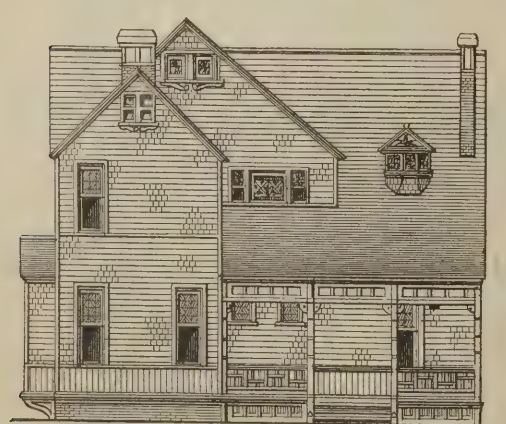
3, showing the entrance to the Washington building, this city, illustrates the tendency displayed by some designers to introduce the grotesque and the mythological into modern architecture. The work shown well illustrates, too, the ready adaptability of the material we are considering to various forms. The lamp posts and the lanterns are of iron, and alone would not be much out of the commonplace. The scrolls forming the balustrade to the steps are also of not unusual forms, but when their convolutions are traced and they are found to merge into the dragon which is vainly biting at the column about which he is coiled, and whose wings extend backward to the face of the building and form a brace or support to the lamp, the observer is impressed with the wonderful diversity of shapes and purposes to which a single material may be adapted. The contrast is still further hightened by a glance at the steps leading into the building, which show another application of iron in modern buildings—the illuminated floor. Our engraving clearly shows the spheres of glass held in a frame of cast iron, which afford light to the space below the stairs without in any way detracting from their utility. All of the ironwork we have illustrated, except the window guards, was executed at the works of Messrs. J. B. & J. M. Cornell, this city. At another time we may give this general subject further attention and illustration.



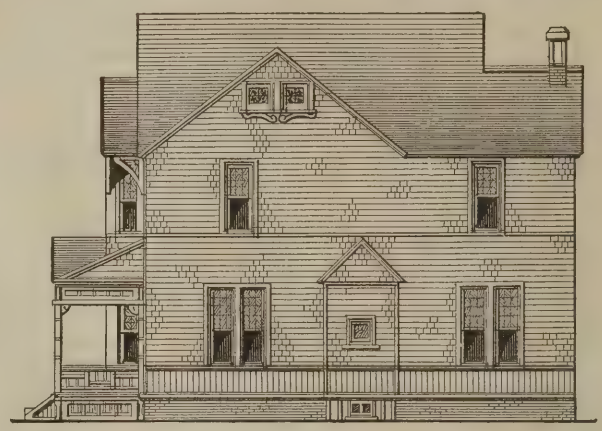
An Inexpensive Frame House.—Front Elevation.—Scale, $\frac{1}{16}$ Inch to the Foot.

An Inexpensive Frame House.

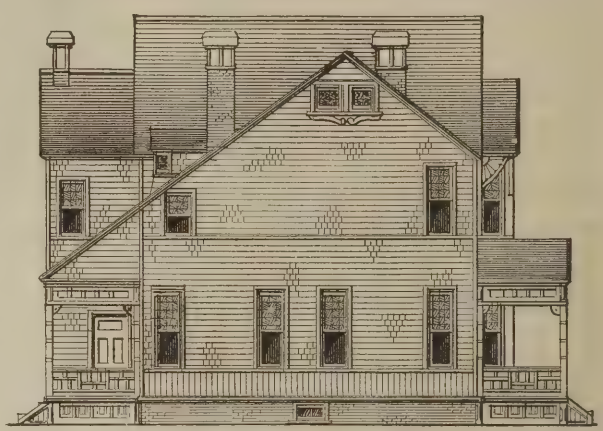
The house design presented herewith is by Mr. Arthur L. Valk, a son of a well-known architect of this city, whose office is in the Tribune Building. It is a characteristic study, and shows a moderate-priced structure, and one in which no money is to be spent in merely decorative features. The elevations are very plain, and yet the building in perspective shows for just what it is—a substantial house in which comfort and convenience, in combination with low cost, have been the special objects aimed at. By reference to the plan it will be seen that eight fair-sized rooms are provided, exclusive of one or two half-chambers which may be secured in the attic, and a sewing-room or clothes press of ample dimensions over the front hall. Each chamber is provided with a large closet, while the two chambers over parlor and sitting-room are connected by a passageway provided with two doors, thus securing absolute privacy when desired. On the lower floor communication between kitchen and dining-room is by means of a passageway, lighted on the side by a small bay window. The pantry opens out of the passage, this being accessible to both rooms. The dining-room is provided with a capacious china closet, while back of it is a kitchen closet opening into the latter room. The end of the hall on the lower floor is cut off and utilized by forming two small closets communicating with kitchen and sitting-room respectively. The kitchen is provided with stationary tubs, sink, brick-set range and dresser, and may be entered from the main hall. Provision for open fires is made in both sitting-room and parlor, while stoves may be placed in the chambers over these rooms if desired. The dependence for heating the dining-room and the chamber over it is a furnace, pipes from which would also lead to the rooms in which other provision for heating is made. There are various other desirable features about the study which our readers will discover on close scrutiny of the plans, elevations and details. Mr. Valk's estimate of the cost of this house, at the present low prices of labor and materials, erected in the vicinity of New York, using the average quality of materials and finish, is about $3500.



Rear Elevation.—Scale, $\frac{1}{16}$ Inch to the Foot.



Side Elevation (Right).—Scale, $\frac{1}{16}$ Inch to the Foot.

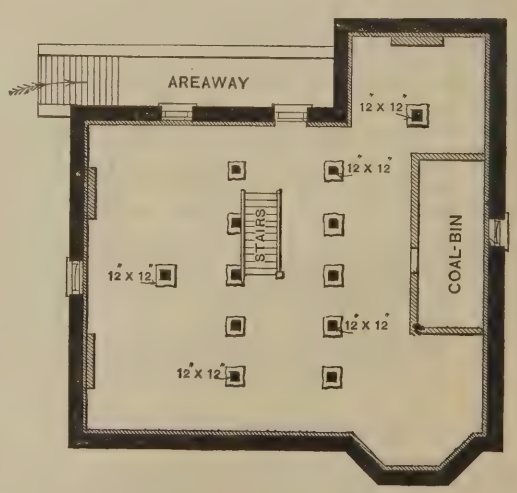


Side Elevation (Left).—Scale, $\frac{1}{16}$ Inch to the Foot.

NOTES AND COMMENTS.

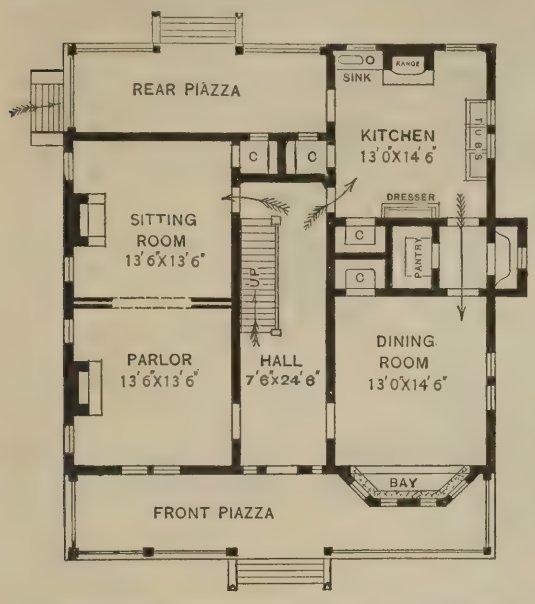
In our issue for November a correspondent presented a question in heating and ventilation which we felt disposed, on account of the importance of the subject, to refer to the practical heating and ventilating engineers among our readers, in order that it might be thoroughly discussed from different points of view. The problem referred to the best method of ventilating a common schoolhouse, the plan of which was submitted. A suggestion of the means of heating the building was also contained in our correspondent's letter. One question raised was the size of ventilating flues necessary to use. Our remarks at the time pointed out that without some artificial means of creating an up draft in the ventilating flues there would be lack of ventilation, no matter what size pipes might be provided. In another part of this issue will be found a carefully-prepared answer to the inquiry of our correspondent, presented by Mr.

The common tradition that the timber of old churches was frequently of chestnut, says an English exchange, seems to have been exploded by the researches of the French chemist, M. Payen, who procured a large number of pieces for examination, and pronounced that they were not chestnut, added to which, chestnut trees, whatever their abundance in old times, are now extremely rare. We are told that if letters are drawn upon oak and chestnut planks, by means of pure sulphate of iron dissolved in distilled water, the characters appear at once in black upon the oak and in deep violet upon the chestnut, while ammonia produces a short-lived red upon the chestnut, which is much paler and less distinct upon the oak. Another mode of examination is by making sections of the wood, which can not well be mistaken, as chestnut timber possesses only concentric layers, while all French and American varieties of oak show the medullary rays crossing the woody fiber from the center across the circumference.

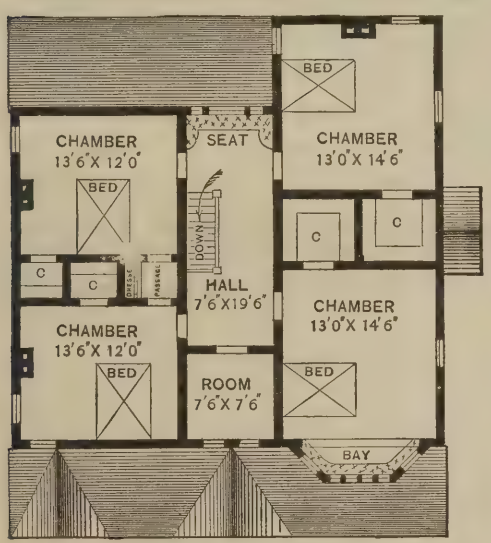


Foundation Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

Henry Gouge, of this city, a ventilating expert who has given particular attention to the special matters which he discusses. The arrangement of the flues, the method of creating the up draft, and other features which are illustrated and described in the article referred to, are peculiar, we believe, to what is known as the Gouge system of ventilation. The communication is none the less valuable to our readers on this account. We commend it to the correspondent who first proposed the question, and to our readers generally who are interested in such matters, as being of special interest, not only as a description of a special system, but also as an exposition of some of the principles upon which any successful system must be based.

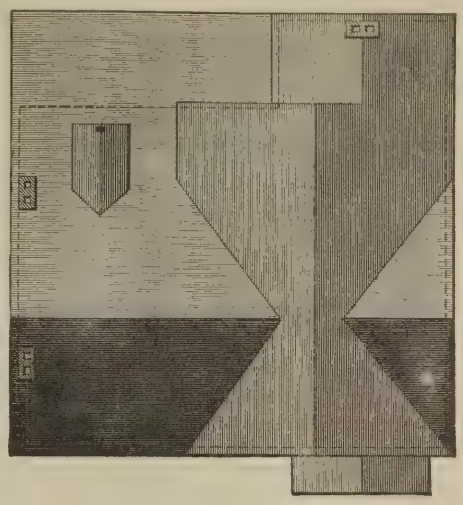


An Inexpensive Frame House.—First Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.



Second Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

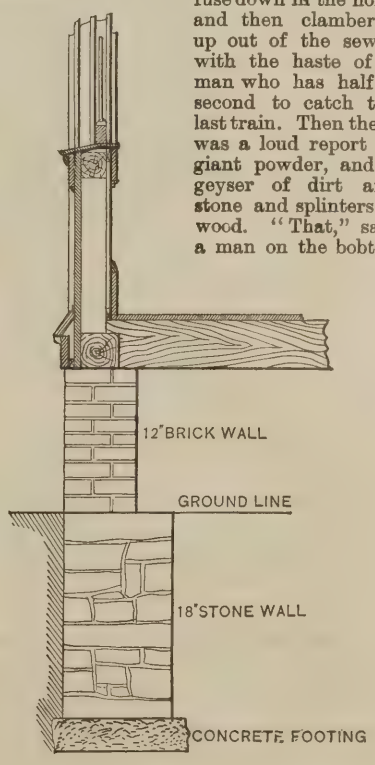
One of the last pieces of professional work which the late Mr. Sloan performed before his death was the drawing and specifications for the new Governor's Mansion at Rawley, N. C. As the building progresses the design appears to be an excellent one, and the building is said to be satisfactory from every point of view. Not only has the design been carefully worked out, judging from such reports as have reached us, but the materials and workmanship of the building are equally admirable. The brickwork is said to be unusually good, while the liberal use of rich brown sandstone as a trimming gives an added grace to the structure. A notable feature in both design and construction is the employment of very large slabs of granite in the doorways. The blocks of sandstone used in this building are the largest ever quarried in the State, and the use of the stone in this case is hailed with delight as showing possibilities for the several varieties of sandstone with which North Carolina abounds. On the 15th day of November, the date of the last account we had of the progress of this building, the walls were well up on the third story. The building is lofty and massive, while the lines run with such pleasing irregularity as to take away all idea of heaviness.



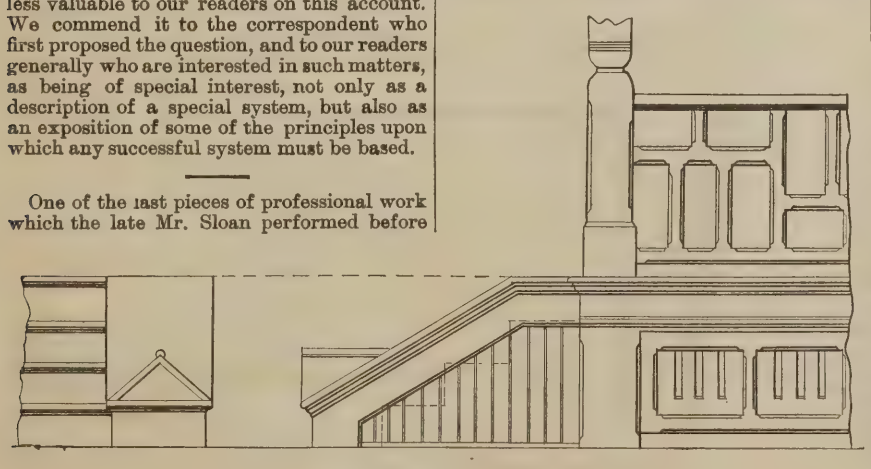
Roof Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

The famous Flood mansion, in San Francisco, is being finished, in part, at least, with cut brown-stone. The stone is all cut, dressed and marked in the quarry in Connecticut, and when reaching the structure is placed in position at once as originally calculated without redressing or fitting. A San Francisco paper a short time since mentioned the arrival of a ship, 150 days from New York, with 350 packages of cut brown-stone for this building. This would seem very much like carrying building material around the globe, or at least a distance nearly equal to the circuit. Such a shipment, it is hardly necessary to remark, is somewhat unusual.

A daily paper, under the head of "Diversions of the Building Business," describes as follows some incidents which are not unlike those that occur somewhat frequently in various parts of New York City: A few months ago the builders of the tremendous "Chelsea" apartment house, in West Twenty-third street, who had been piling up bricks and stone till dwellers on the opposite side of the street began to speculate about the probability of the flat's touching the moon, suddenly stopped short at the fifteenth story, put on a roof, and climbed down to the sidewalk to excavate a sewer. They struck rock a few feet below the surface and began to blast. One morning recently, as a bobtail car rattled through Twenty-third street, a workman in a red skirt climbed out of the sewer cavity and waved a red flag frantically. The car came to an abrupt halt, and so did a rumbling stage, and a crowd of pedestrians stood still and clapped their palms over their ears. Another workman with a blue jumper ran in an opposite direction and waved back a group of women, three errand boys, a truck and two carriages. Others came up and stopped. When everything had come to a standstill a third workman touched off a fuse down in the hole, and then clambered up out of the sewer with the haste of a man who has half a second to catch the last train. Then there was a loud report of giant powder, and a geyser of dirt and stone and splinters of wood. "That," said a man on the bobtail car, "is a nice little show we have half a dozen times a day. It has driven most of the residents of this street into the country."



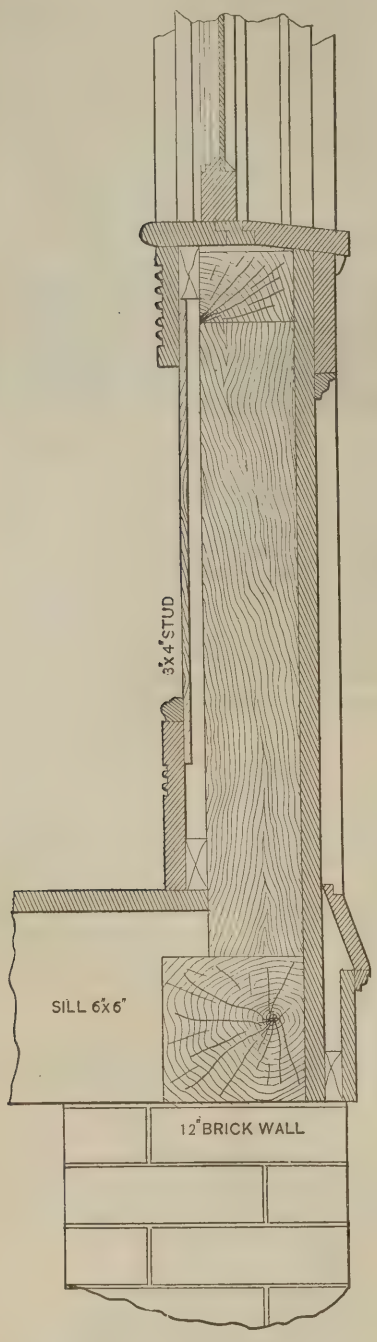
Vertical Section Through House, Showing Foundation Wall.—Scale, $\frac{3}{8}$ Inch to the Foot



Details of Piazza.—Scale, $\frac{3}{8}$ Inch to the Foot.

The following particulars with reference to the brick industry along the Hudson, particularly in the district known as the Haverstraw neighborhood, will no doubt be of interest to our readers. The total output in brick for last season is upward of 300,000,000. Fifty yards are in operation in and about Haverstraw, with an average product of 6,000,000 bricks each. The daily production in the yards on the Hudson commences at sunrise, and by half-past 10 o'clock there will be in the yard drying, if two machines

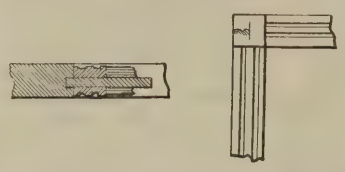
are used, 40,000 bricks, and if three machines are used no less than 60,000 bricks. In this region brick-makers do not think it very much of an average if the product falls below 1000 bricks per man per day the season through. There are about 100 yards



An Inexpensive Frame House.—Section Through Wall.—Scale, 1½ Inches to the Foot.

along the Hudson, including the Haverstraw yards above mentioned, sending their product to one market, namely, New York City.

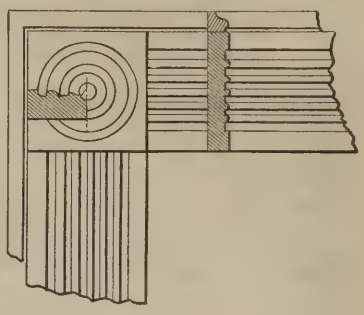
Few of our readers can have failed to notice the widespread popularity of roller skating at the present time. The demand for roller-skating rinks is becoming very general, and there are comparatively few towns, in some sections of the country at least, which do not boast of one or more places of amusement of this character. Some of the features of construction necessary to buildings of this kind, in order to fit them to the uses to which they are to be put, are occasionally perplexing to builders. One of the first requirements is a strong, smooth and even floor, and a number of experiments have been made for securing such a surface as is best adapted to the purpose. A rink that has been recently erected in Indianapolis, Ind., has been furnished with what is described as a paper floor. This flooring was made by pasting and pressing straw boards together under a powerful hydraulic press in the same general manner as the disks of paper car-wheels are prepared. After these blocks had been perfectly seasoned and dried they were sawed up into floor pieces and were laid with the edge of the paper forming the surface of the floor. This sur-



Section of Door, and Paneling of Inside Door.

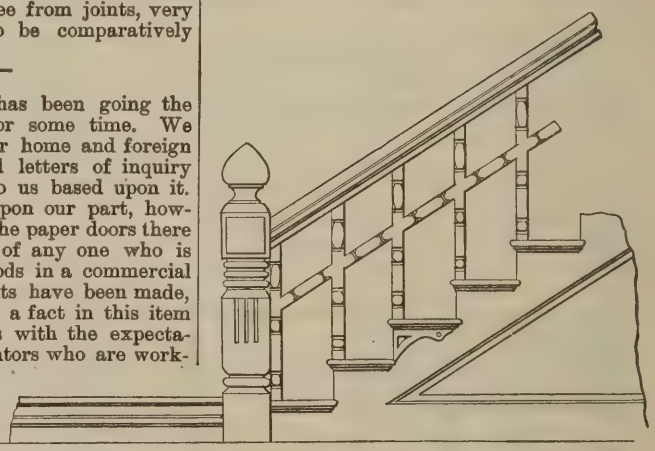
face was then carefully smoothed and finally sandpapered until, in the language of a local reporter, the floor was made "as smooth as ice." The adhesive quality of the paper, it is claimed, prevents any slipping of the roller upon the floor. The floor also has the advantage of being free from joints, very smooth, and is said to be comparatively noiseless.

The following item has been going the rounds of the press for some time. We have seen it in both our home and foreign exchanges, and several letters of inquiry have been addressed to us based upon it. Careful investigation upon our part, however, has failed to find the paper doors there described, or to learn of any one who is manufacturing such goods in a commercial way. Many experiments have been made, and what is asserted for a fact in this item very closely corresponds with the expectations of numerous inventors who are working upon the problem. From the fact that a stray item of this kind is of such wide interest it is to be inferred that paper doors, whenever they are perfected and introduced to the notice of house owners, will receive a cordial welcome. The item referred to is as follows: "Feel the weight of that door," said a New York builder to a reporter who was looking at an unfinished apartment house up town. The reporter prepared to lift what seemed a polished mahogany door, but it proved too light for any wood. "It is made of paper," said the builder, "and, while it costs about the same as wood, is



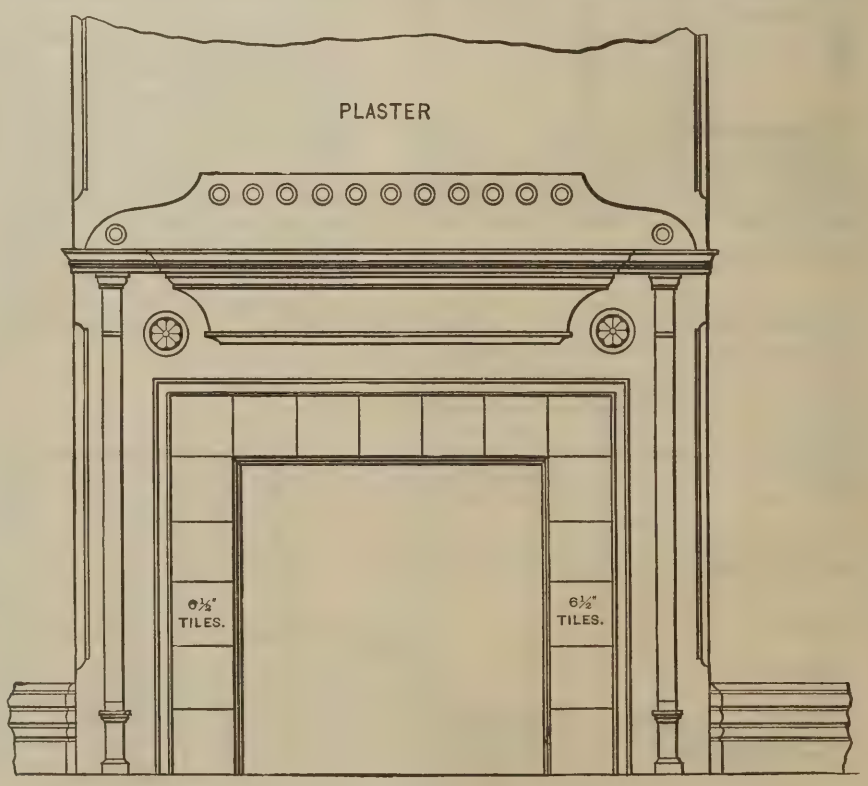
Detail of Door Trimming.—Scale, 1½ Inches to the Foot.

much better, because there is no shrinking, swelling, cracking or warping. It is composed of two thick paper boards stamped



Staircase, Newel and Finish.—Scale, 1½ Inches to the Foot.

and molded into panels, and glued together with glue and potash, and then rolled through heavy rollers. It is first covered with a water-proof coating, and is painted and varnished and hung in the ordinary way. Few persons can detect that they are not made of wood, particularly when used as sliding doors."

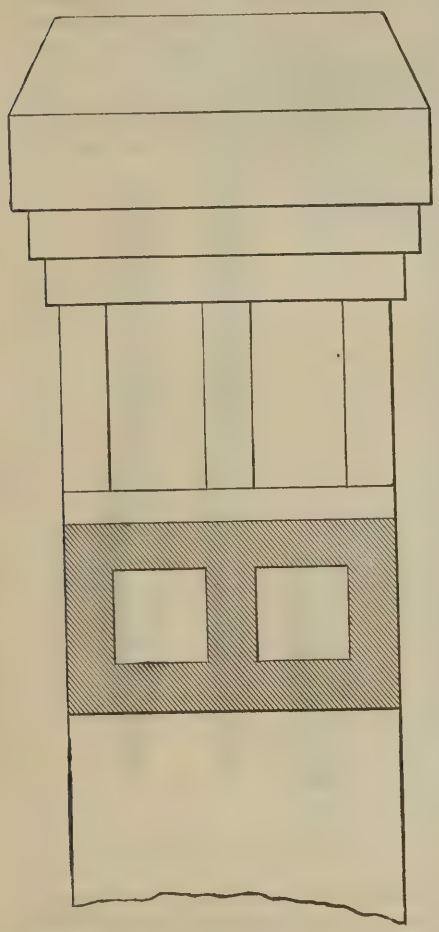


Parlor and Sitting-Room Mantels.—Scale, ⅝ Inch to the Foot.

NEW PUBLICATIONS.

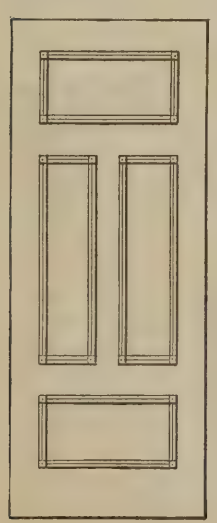
ARCHITECTS' AND STAIR-BUILDERS' TABLES OF TREADS AND RISERS. By John A. Hamilton, architect. Oblong, 4 x 6½ inches, bound in cloth. Published by Wm. T. Comstock. Price, 50 cents.

This little work is a photo-lithographic reproduction in convenient form for use of



An Inexpensive Frame House.—Detail of Chimney.—Scale, ¾ Inch to the Foot.

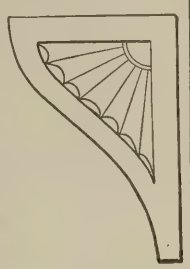
a table which the author says he has found of great advantage in his own practice, and which is now offered to the public at the request of a number of architects and stair-builders who have had opportunity of testing its usefulness. Its special feature is the saving of time by rendering unnecessary many of the calculations usually required to be performed in designing and constructing stairs. The tables, for the one table is divided so as to admit of printing on a number of pages, is prefaced by directions for use. The scope of the work may be gained from the statement that the first column shows in inches and fractions of an inch the hight of riser, or width of tread, as the case may be. The top line gives the number of risers. The table is used in determining the number of risers needed for a story from floor to floor by first approximating the hight of riser. Taking, for example, a story 171 inches, or 14 feet 3 nches high, and assuming a 7-inch riser, there is found in the table of risers measuring 7 inches and upward the figure 171, which shows that the riser required is the one at the end of the line in which it occurs, which proves to be 7⅛, thus showing the exact riser that is to be used. The rule, then, is for number of risers, follow along from approximate hight of riser in first column to figure nearest hight of story. Then follow up to top for number of risers. For run, find number of risers in bottom line, and follow up until opposite width of tread in first column. This explanation of the use of the table indicates its great utility.



Inside Doors.—Scale, ⅜ Inch to the Foot.

ARCHITECTURAL PERSPECTIVE FOR BEGINNERS. Containing 11 plates of practical examples, considered with reference to a student in an architect's office. By F. A. Wright. Quarto, 11 x 18 inches, bound in cloth. Published by Wm. T. Comstock. Price, $3.

In the preparation of the work Mr. Wright has had specially in mind that large class of draftsmen who are obliged to be self-taught. From his own experience, he has been convinced that the books heretofore available to the student are entirely inadequate or too complex, if considered solely with reference to the needs of an architect's office. The author has aimed to supply in a practical way the want he is convinced exists, and in the book he has made all merely theoretical considerations of such features as visual rays, vanishing points, parallel planes, and other phenomena peculiar to perspective, entirely subservient to the practical work of making such a perspective of a house as is every day required in an architect's practice. The method followed in the book is the same as the author has followed with his office pupils, and the rapidity and ease of their advancement is the measure of the utility of the present work. The plates are the principal feature of work, and they are faced by the several chapters of text. The latter is in a much smaller type, considering the size of the page, than looks well, or, we imagine, will be entirely acceptable to many students.

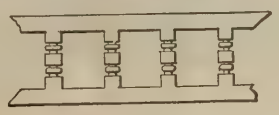


Bracket on Octagon Bay.—Scale, ⅜ Inch to the Foot.

HOWER'S LIGHTNING SLATE RECKONER. Pocket-book form, 54 pages, 5 x 7 inches. Published by F. M. Hower. Price, $1.50.

This last edition to the literature of the slate trade contains tables relating to 33 practical sizes of roofing slate, arranged in a form to be somewhat more convenient for use than anything which has preceded it. The tables are calculated for 3-inch lap, and in the first column the number of slate are given, and in the second the number of square feet which they will cover on the roof. The latter are arranged in numerical order from 1, advancing by single feet up to 1000, or 10 squares. One of the most important tables in the book is a table of ratios, giving the variation in the lap and the amount of nails required to lay a square of each of some 33 sizes of slate when used 2-inch lap, 3-inch lap and 4-inch lap. The book is the production of a practical quarryman, and seems to be well calculated to meet the special demand which it has been put out to supply. A preliminary chapter is devoted to the consideration of slate as a roofing material. Various

Turned Column to Piazza.

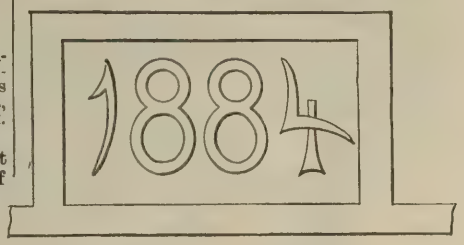


Hanging Balustrade Balcony.—Scale, ⅜ Inch to the Foot.

facts are presented in this which are of interest to builders and architects generally.

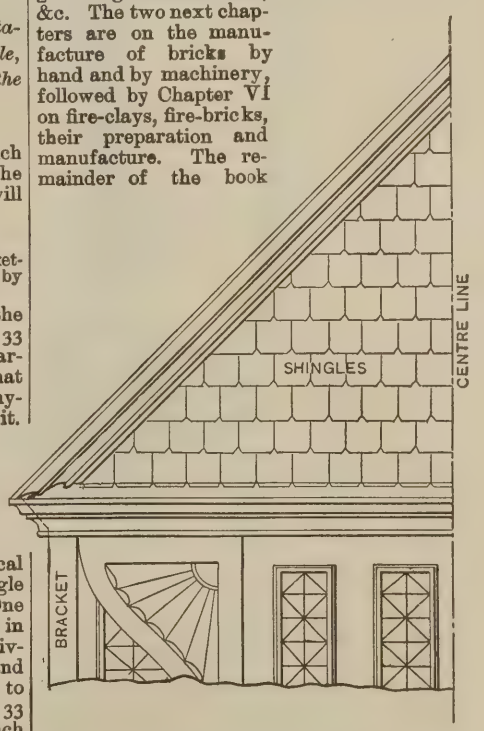
MANUFACTURE OF BRICKS, TILES AND TERRA-COTTA. By Charles Thomas Davis. Size, 9½x6 inches, 472 pages. Published by Henry Carey Baird & Co. Price, $5.

The manufacture of bricks, tiles and terra-cotta, as well as a consideration of the modern methods and appliances by which they are produced, have, as Mr. Davis observes, never heretofore been practically treated in any work. Such being the case, the difficul-



Date Tablet, Front Gable.—Scale, ⅜ Inch to the Foot.

ties attendent upon the task that Mr. Davis has attempted will be readily appreciated. While the art of brick-making dates from the most remote antiquity, and is consequently a widely known, if not necessarily well-underetood, subject, there has within a comparatively recent period been a great revival in tile and terra-cotta manufacture, due to the largely-increased demand for these materials for ornamental building purposes. The book is divided into nine chapters. Beginning with the history of bricks, the author follows with a description of the different varieties of clay, their characteristics, qualities and the localities where they are found, after which are some general remarks on bricks, enameling bricks and tiles, glazing earthenware, &c. The two next chapters are on the manufacture of bricks by hand and by machinery, followed by Chapter VI on fire-clays, fire-bricks, their preparation and manufacture. The remainder of the book



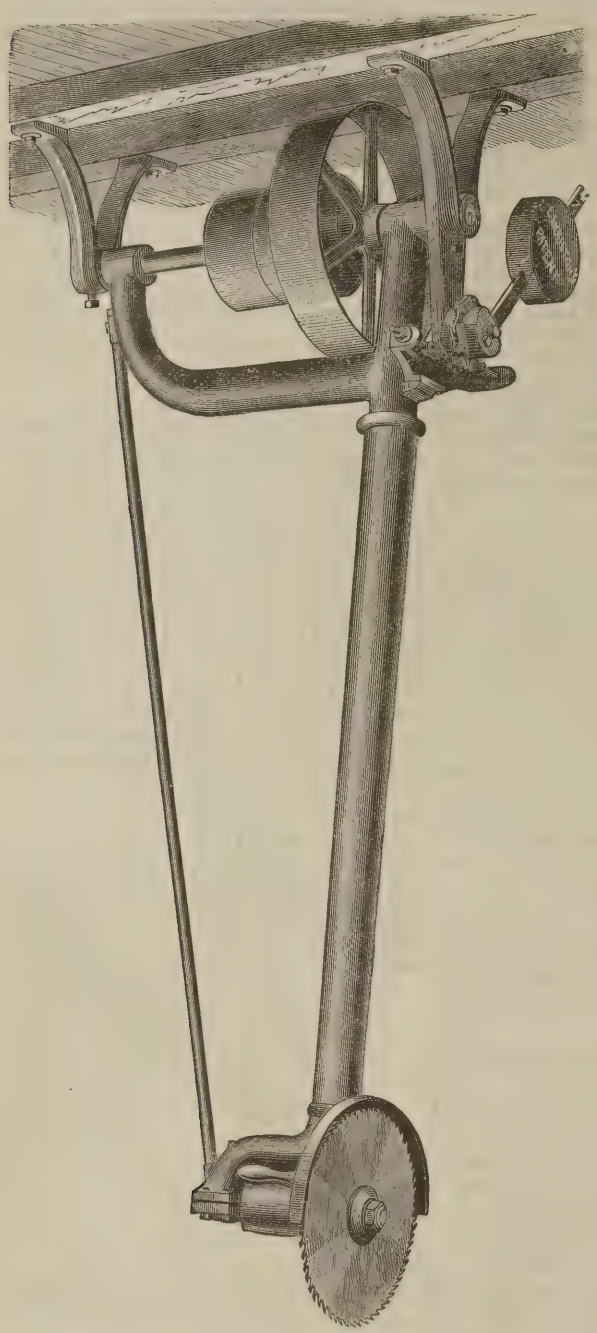
Detail of Octagon Front.—Scale, ⅜ Inch to the Foot.

treats of terra-cotta and tiles. Historical sketches are given of terra-cotta and tiles, together with their use and method of manufacture, the final chapter being devoted to ornamental tiles. Apart from the general merit of the work as the above *resumé* of its contents would indicate, the book is published in a very tasteful and serviceable manner, the subject treated of being illustrated by 228 engravings and 6 plates, besides being well and fully indexed. To the manufacturer or other person commercially interested in bricks the book will be of much interest, while the general reader will derive both pleasure and profit from its perusal.

NOVELTIES.

Houston's Swing or Slash Saw.

The increasing demand for swing-saws for planing, sash, door and blind mills and box factories, and cutting slabs in saw mills—in fact, for all mills where lumber is to be cut into equal lengths with square ends—has induced Mr. Levi Houston, of Montgomery, Lycoming County, Pa., to place on the market the counterbalanced swing-saw shown in Fig. 1. With the counterweight adopted by Mr. Houston he has overcome what has hitherto been a great objection to swing-saws—that of having the ponderous weight used as a counterbalance always to lift in operating the saw. By examining the accompanying cut it will be seen that the operator is not only relieved from lifting the weight of the counterbalance, but it actually aids him in pulling the saw through the lumber, thereby making it as easy to cut off a board 30 inches wide as one only 4 inches. The frame combines strength and rigidity, while it is at the same time light. It is cast all in one piece with a cored center. The shaft on which the saw swings is stationary—set-screwed in the hangers, as shown in cut. This tends to make it perfectly rigid and not liable to get out of line. The pulley that runs the saw and the driving pulley are fastened together on an oil-chambered sleeve, thus leaving all pulleys virtually loose on the counter-shaft. The saw being once properly placed, it remains so, there being no journals to wear and throw it out of line. The cut shows the position of the weight when the saw is back of the guide. The saw works equally as well under the bench as above it. The regular length from base of hangers to center of arbor is 7 feet 2 inches, but can be made to any required length and right or left hand. The weight of the saw, crated ready for shipment, is 500 pounds.



Novelties.—Fig. 1.—Houston's Swing or Slash Saw.

Combination Tool.

In our issue for January, 1883, we presented full-size elevation and section of the new combination tool known as Kidder's patent tool-holder. The tool may be briefly described as consisting of an outer case or handle, within which is a reservoir or receptacle for the tools. A thumb-plate projects through one side of the handle, and is numbered to correspond with the tools held within. By bringing any number on this plate to the front a tool will be so placed in the holder that by loosening the chuck at the bottom it will drop through, and may be securely fastened in place by turning the chuck in the opposite direction. The tool differs from combination tools of a similar character heretofore introduced in the fact that there is no necessity of handling the individual tools, each of them being provided with a place within the tool handle from which they may be projected through the clutch, as already described. Since our notice of this artice certain improvements have been made and additional tools have been added to the assortment which the holder formerly contained. A small screw-driver and a prick or scribe awl are the new items which have been added. The interior construction has been so modified as to make the operation more efficient than before, as well as to facilitate the manufacture of the tool. The makers are the Coates Clipper Manufacturing Company, of 237 Chandler street, Worcester, Mass. The handle of this tool is made of malleable iron and steel, and is nickel-plated, giving it a very neat appearance. It is a tool which will be appreciated by those who are fond of labor-saving devices and who enjoy fine workmanship and ingenious construction.

Post-Hole Tool.

The tool illustrated in Fig. 2 is intended for sinking post-holes and other similar uses. It is made by the Cronk Hanger Company, Elmira, N. Y., for whom John F. Lovejoy is agent, at 98 Chambers street, New York. It consists of a steel-pointed bar with a polished, cast-iron stationary sleeve, as shown by B. With this bar

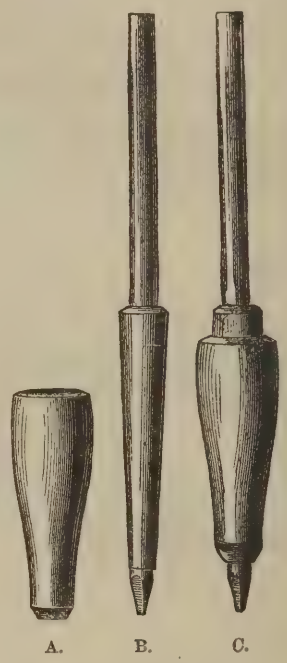


Fig. 2.—Post-Hole Tool.

the soil is first penetrated to the depth required. Then the expander, which is shown by A, is applied, when the tool assumes the form shown by C, by which the hole is enlarged to receive the post. The bars are made with a changeable cast-steel point which may be renewed and sharpened when dulled by use. The manufacturers direct attention to the superiority of this implement in the saving of time and labor, adding that, while it gives the advantages that are connected with driving the posts, it obviates very much of the labor and the destruction of posts which often results.

Adjustable Wrought-Steel Mirror Hinge.

Fig. 3 represents a new article which has just been put on the market by the Eagle Lock Company, Terryville, Conn., and 98 Chambers street, New York. It is intended especially for the use of furniture manufacturers, and is offered with confidence as being a superior article. Its use will readily be understood from the cut, the hinges being fastened, as indicated, to the back of the mirror, and of the frame in which the mirror is placed. Friction can be regulated by the screws with which the hinge is secured, so that it will work with a light or a heavy glass, and by means of this contrivance the mirror can be held in any desired position. The hinges are copper-bronzed, and are very tastefully gotten up.

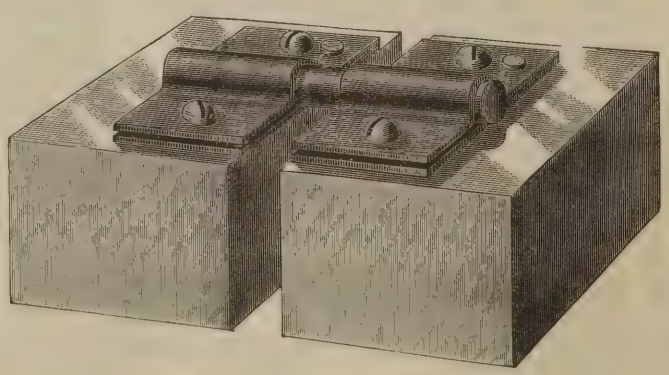
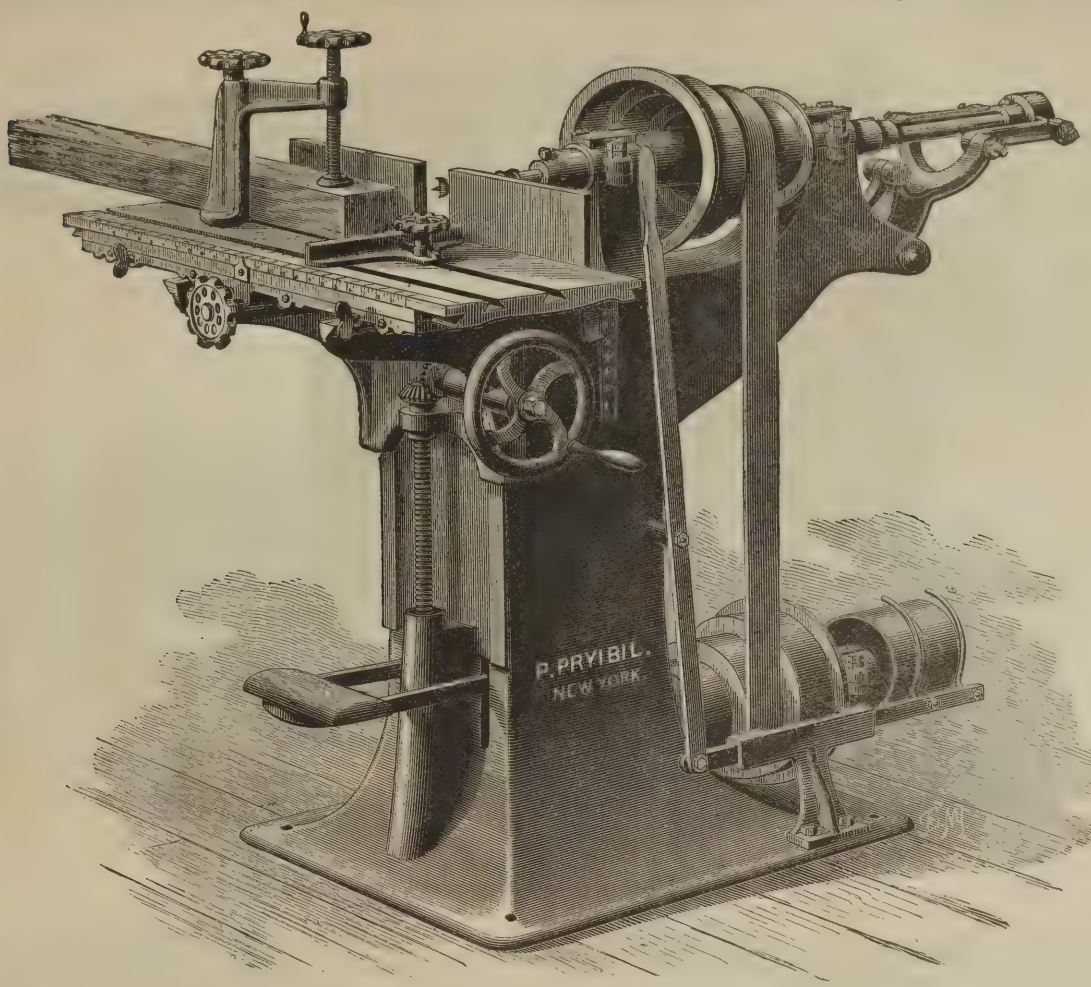


Fig. 3.—Adjustable Wrought-Steel Mirror Hinge.

Horizontal Boring Machine.

In Fig. 4 we show a horizontal boring machine recently brought out by P. Pryibil, manufacturer of wood-working machinery, corner of Fortieth street and Tenth avenue, New York City. The machine is adapted to a large variety of work, including rosette cutting and mortising. The latter is done by a cutter cutting out both ends and sides, producing, when the work is moved sideways, a mortise with half-round ends. The spindle is steel, fitted to a steel tube in which it revolves and in which it slides. The wear is thus confined to the tube, where it can be easily taken up by the adjustable caps. The spindle has a longitudinal movement of 6 inches, and is provided with an adjustable stop-collar. The table has a movement of 10 inches in the direction of the length of the spindle, to enable it to be set close to bitts of various lengths, and to enable the rosette and mortising gutters to be used close to the bearings. It also has a vertical movement of 12 inches and a lateral movement of 14 inches. The latter is effected through the end-wheel in front, and its extent can be limited by two adjustable stops provided for the setting to sizes. The hight of the treadle is adjustable, to enable the operator to set it low when boring shallow holes, so that he will not have to raise his foot unnecessarily high. The pulley is self-oiling, and the machine can be driven from above, below or from either side. The belt shifter may be used on either side of the machine. The weight is about 735 pounds.



Novelties.—Fig. 4.—Horizontal Boring Machine.

Instantaneous-Grip Vise.

Figs. 5 and 6 show two forms of the instantaneous-grip vise which has recently been brought out by Thomas C. Massey, Nos. 11 to 23 South Jefferson street, Chicago, Ill. The two cuts presented do not by any means illustrate the whole of Mr. Massey's invention relating to vises. The principle which he has incorporated in the construction of these tools is applicable to almost the entire line of vises in use, while the two forms that we show are only those which are specially valuable to carpenters and members of other wood-working trades. Both of the engravings are sectional in character and show the means by which the vise is instantaneously adjusted to the approximate position in which it is required, and how it is drawn tight in the usual manner. The handle starts from the perpendicular and moves to the right. When it has accomplished one-quarter of the circle, or, in other words, when it has reached a horizontal position, the cam H has lifted the teeth of the dog L into gear with the teeth of the long rack E. The spiral end of the cam at the same time has taken up all lost motion. Accordingly, when the handle is in a vertical position, as shown in both of the cuts, the vise may be adjusted approximately to any position required. Then by turning it a quarter circle the teeth engage as just described, and by pressing the handle still lower the work is firmly grasped between the jaws. To release the work all that is necessary to do is to bring the handle back to a vertical position, when the front jaw of of the vise may be withdrawn by the hand, as already indicated. The time-saving advantages of these vises are very considerable. For instance, a piece of work 1 inch thick can be released from the jaws and an 8-inch piece substituted and tightly gripped with less than one revolution of the handle, and by a continuous motion of the right hand. As will be perceived by examination of the

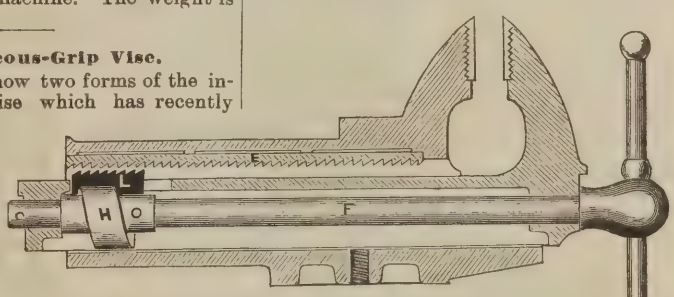


Fig. 6.—Massey's Vise for Coach-Makers.

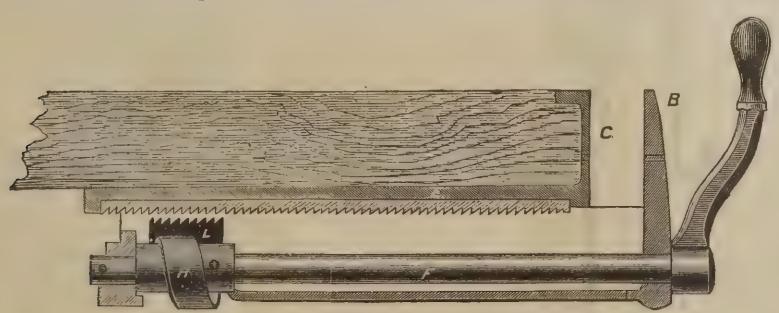


Fig. 5.—Massey's Instantaneous-Grip Vise for Carpenters.

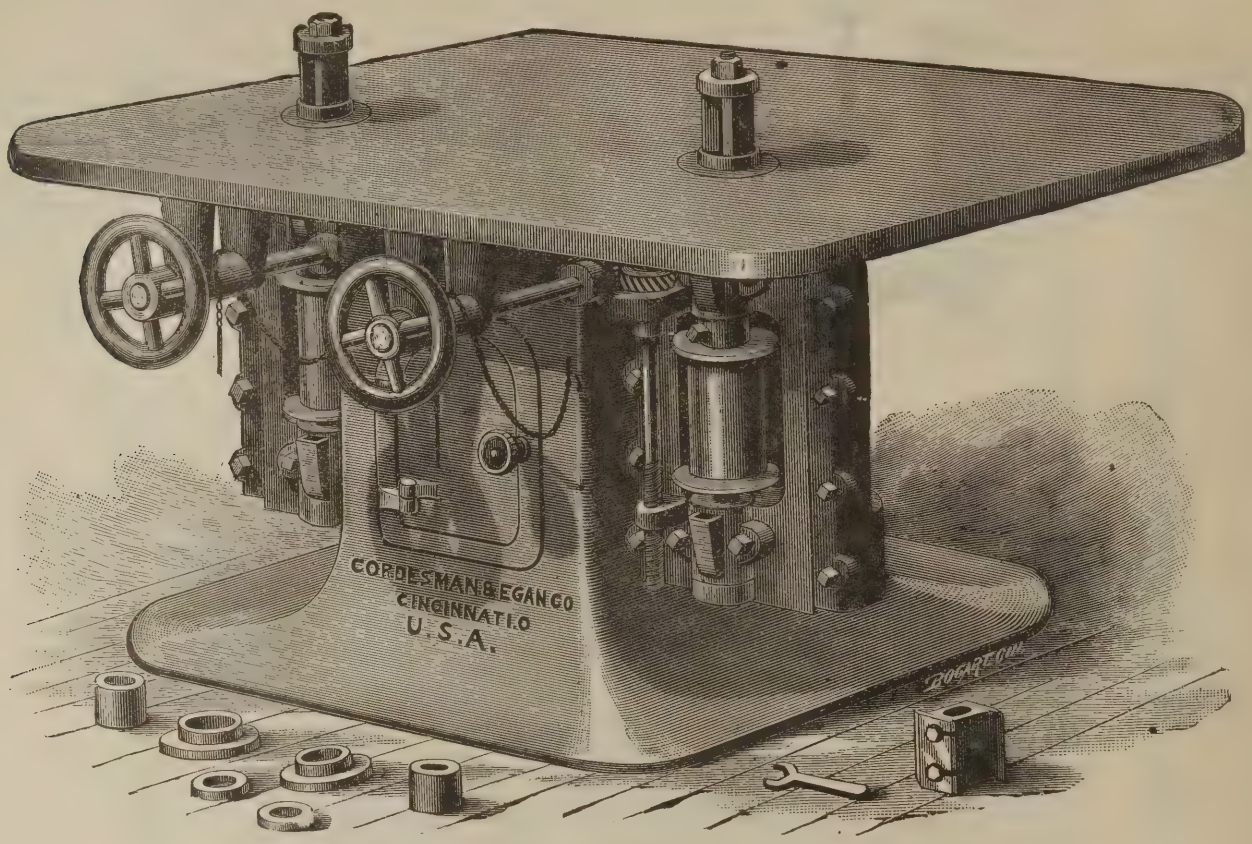
purpose. The table is provided with an adjustable square and miter gauge, an adjustable clamp and iron fence, with tapered dovetail ends for facilitating the application of special wooden fences, and with scales for

engravings, the vise is simple in all its parts, and there is nothing about it liable to get out of order. Fig. 5 shows a vise working level with the bench top, and of a form to be specially-useful for carpenters, car builders, cabinet-makers, &c., while Fig. 6 shows a form of vise useful to coach-makers and some other classes of trade.

The jaws of the vise shown in Fig. 5 are made 9 inches wide, and those shown in Fig. 6 are 4½ inches wide. They are always parallel with each other, the loose jaw sliding in ways or grooves of the stationary jaw. Work can be placed in them in any position desired —parallel, perpendicular or otherwise. The stationary jaw C of Fig. 5 is easily attached to the bench, four screws holding it in place, the jaw being slightly let into the bench. Both jaws in this vise are flush with the top of the bench. They are so made that wood jaws can be attached to them if necessary. The Eastern agency for these goods is in the hands of the Link Belt Machinery Company, No. 81 John street, New York.

Double-Spindle Shaping Machine.

The machine illustrated in Fig. 7 is a double-spindle shaping machine recently brought out by the Egan Company, of Cincinnati. The machine has been designed for use in all establishments requiring a substantial article and one that will endure the heaviest work. The frame is cast in one piece, and the entire machine is constructed in a very thorough manner. The spindles are of large diameter, running in long bearings lined with the best Babbitt metal, and are capable of carrying a large slotted head, which is found very convenient for many kinds of work. The machine is specially convenient in carriage and wagon manufactories and works devoted to the production of agricultural implements. It is useful for such work as shaping wagon tongues, wagon gearing, plow beams and the like. The spindles, with the boxes in which they run, raise and lower on an extension of the frame. The pull of the belt is always against the solid frame. The bits used can be straight flat bits which run between two slotted steel collars, or the bits may be right and left. Raising-wheels are provided in front for raising and lowering the spindles, and they are so located as to be convenient to the operator. They are constructed with screw cut gears, and work easily. The table is of iron or wood, and measures 52 x 48 inches. Rings are let into the table, so that when large or small bits or heads are wanted to be run on the spindles the change can be instantly made.



Novelties.—Fig. 7.—New Double-Spindle Shaping Machine.

A Double-Crank Breast Drill.

The double-crank breast drill, Fig. 8, recently put on the market by the Millers Falls Company, 74 Chambers street, New York, has some special features in its construction which, it is said, add considerably to the efficiency of this style of tool, making it more powerful and durable. Little description is necessary beyond calling attention to the accompanying cut, which presents a general view of the drill. The power is transmitted to the drill through very heavy cut gears, which are speeded about two to one. Double cranks, which are adjustable to any length, and by which the speed and power may be regulated as desired, allow of both hands being used simultaneously in the operation of the drill. The breast-plate is 12 inches long, and curved to fit the shape of the body, thus preventing the tool from swinging around when in use. The hole in the spindle which receives the drill is ½ inch in diameter. The same company provide Morse twist drills of all sizes, with ½-inch shank, to fit this machine. They also sell a special chuck which will hold all round and square drills below $\frac{1}{16}$ inch in diameter. The special features referred to above in the construction of this drill in which the improvement lies are the new form of the breast-plate, together with the double handles for rotating the drill. By the use of such a broad breast-plate the operator can apply pressure to the drill with more convenience and comfort, because of the greater surface presented to the body; its curved shape also prevents the tool from rotating when in operation. By the use of the two handles much greater power can be executed on the drill, besides distributing the work to both arms. The method of altering the lengths of the cranks to which the handles are attached is shown in the cut. The two set-screws near the crank axis allow the cranks to be set at any desired length, as the quality of the work requires. The tool throughout is finely finished, the standard of cast iron being lacquered, and the cranks, arms and chuck nickel-plated.

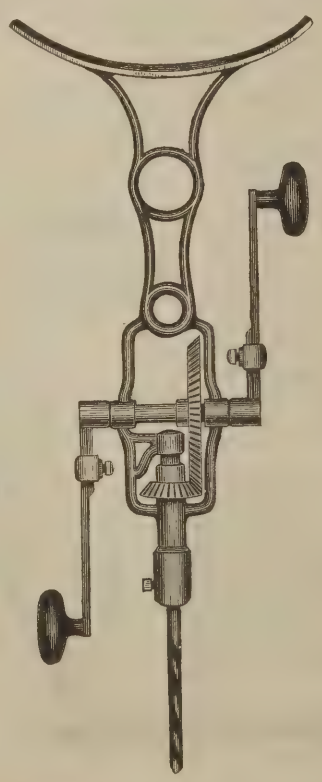


Fig. 8—General View of the Double-Crank Breast Drill.

The Victor Scroll-Saw.

The Seneca Falls Manufacturing Company are introducing a new scroll-saw called the "Victor," which is adapted for either foot or steam power. A general view of the machine, arranged for foot-power, is afforded by Fig. 10 of the engravings. This machine has greater capacity than many other scroll-saws in the market with which it might be compared, which takes it out of the realm of amateur machinery and adapts it to use in planing mills, carpenter shops and wood-

working establishments generally. It is so constructed as to be suitable for either light or heavy work, and the makers offer it as a tool cutting with the greatest precision from

Novelties.—Fig. 9.—"Victor" Lathe, an Attachment for the Scroll-Saw Shown Below.

the lightest and most delicate material that might be put into it up to stuff 3 inches thick. It has a swing of 24 inches. The machine is provided with an adjustable tension in connection with the upper spindle, that may be varied to suit the operator. Regular 8-inch saw blades can be used in this machine, and yet it can be adjusted so as to use 5-inch blades for fine work, if desired. The table is of iron, made to tilt. It is 18 inches in diameter, and can be changed to any angle for sawing inlaid work. The table and all other finished parts of the machine are nickel-plated, a fact which gives it a fine appearance. An adjustable upright drilling attachment is provided, which is clearly shown in the engraving. A dust blower is also provided, which works satisfactorily, and keeps the lines of the work free from sawdust. The driving-wheel is made heavy, and is 24 inches in diameter. When used as a foot-power machine it is provided with a double

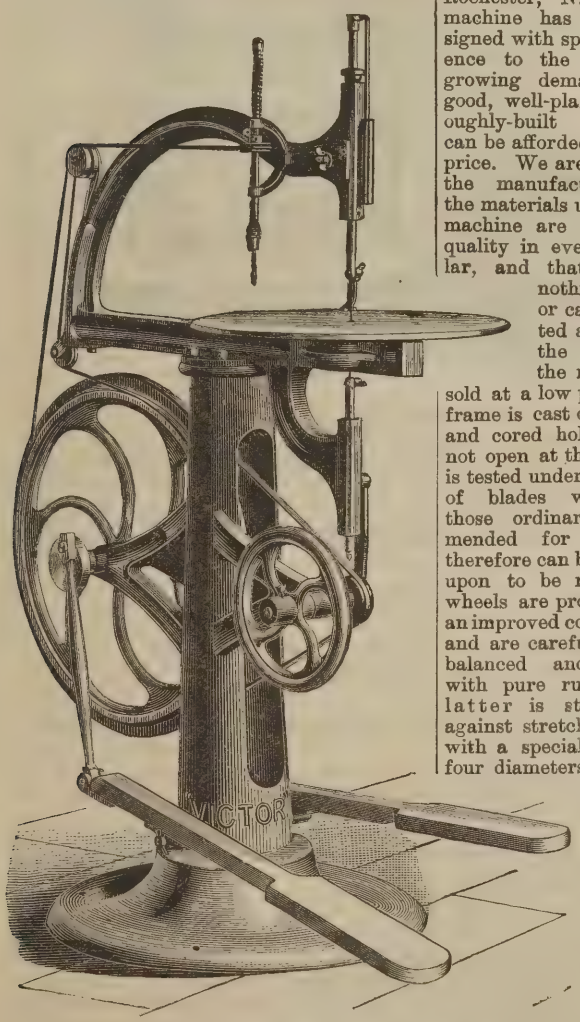


Fig. 10.—The "Victor" Scroll-Saw Arranged for Foot Power.

foot-treadle, with a walking motion, a device by which much greater power can be obtained with less fatigue than in the ordinary form. The average rate of speed while sawing is about 100 strokes per minute. The hight from floor to top of table is 40 inches, which enables the operator to run the machine with both feet when he is sitting, or to stand at the machine and operate it with one foot. When furnished for steam-power, tight and loose pulleys arranged to connect with the driving-wheel shaft are provided on either side, leaving the treadle connected on the opposite side. In Fig. 9 we show what is called the "Victor" lathe, an attachment that is furnished by the company with the saw above described. When in use this lathe takes the place of the saw table. The length of bed is 26 inches, the distance between centers 15 inches and the swing 6 inches. The head is a hollow-steel spindle, nicely fitted with face-plate, spur center, cap center, &c. On the outside is fitted a 4-inch solid emery-wheel for dressing and polishing tools, metals, &c. The tail-stock has a steel screw spindle with hand-wheel. With this lathe there is furnished a set of cast-steel turning tools with 6-inch blades and hardwood handles. The average speed of the lathe is about 4000 revolutions per minute.

New Low-Price Band-Saw Machine.

Fig. 11 of our engravings represents a new 30-inch band-saw machine just being put upon the market by Mr. F. H. Clement, 131 Mill street, Rochester, N. Y. The machine has been designed with special reference to the large and growing demand for a good, well-planned, thoroughly-built tool which can be afforded at a low price. We are assured by the manufacturer that the materials used in this machine are of the best quality in every particular, and that there is nothing cheap or carelessly-fitted about it; at the same time the machine is sold at a low price. The frame is cast on one piece and cored hollow. It is not open at the back. It is tested under the strain of blades wider than those ordinarily recommended for use, and therefore can be depended upon to be rigid. The wheels are provided with an improved concave arm, and are carefully turned, balanced and covered with pure rubber. The latter is strengthened against stretching, and is fastened in place with a special cement. The bearings are four diameters in length, and the boxes are carefully lined with a fine grade of Babbitt metal. The shafts are of steel; the loose pulley is self-oiling and the hub is extra length. The upper wheel has a vertical adjustment to strain the blade and a swinging adjustment to shift it on the face. It is cushioned on the straining screw by means of a long-range tempered steel spring. The tables are of kiln-dried hardwood. The main table can be tilted to an angle, and has a clamping-bar across the slit. The guides are of hardened steel and wood, and have all necessary adjustments. The belt shifter is adjustable for any direction of belt. Sawdust brush, belt-guard for upper wheel and sway guides are provided. The machine the manufacturer offers is well adapted to the lighter grades of work such as are found in carpenter shops, bracket shops, pattern-making establishments, cabinet works, chair, toy and job shops, and in factories devoted to the production of cars and wagons where the heavy work is done on a larger machine. A wrench, scarfing frame, tongs and one band-saw blade are furnished with each machine.

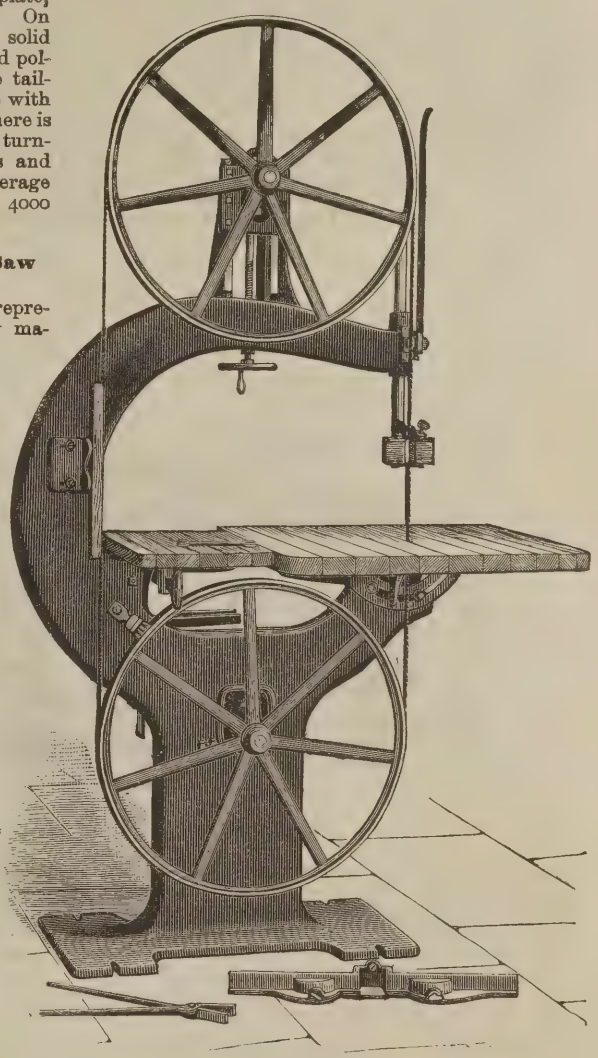


Fig. 11.—New Low-Price Band-Saw Machine.

Value of American Forests.

Although wood is an article in universal use in some of its forms, and is more familiar to the people than any other article or commodity, there are few who have any accurate idea of the value of the forestry products of the United States. Nine out of ten would say there are a dozen products of industry more important than those of wood. Herein they would make a great mistake. The most important and most valuable product of agriculture is corn. In the last census year the value of the corn crop was $679,714,499. The report of the Bureau of Agriculture for the year 1883 states the annual value of the forest product at $700,000,000. These are astonishing figures. The value of the principal products of the country stand in the following order:

Forestry	$700,000,000
Corn	679,714,499
Wheat	474,291,850
Hay	371,811,084
Cotton	280,266,242
Oats	150,243,565
Gold and silver	74,400,000
Coal, anthracite and bituminous	94,500,000
Iron ore	20,470,000
Total mineral, precious and not	218,385,452

Of this vast sum of products, those of forestry constitute nearly one-quarter. The inquiry will arise to the lips of many. In what way is wood so extensively used? No

doubt by far the largest part of it is used in the form of what is comprehensively known as "lumber." As lumber it is used for building material, fencing and innumerable manufactures. Besides these, it enters into the industries of the people in many other forms. By the last census we find the value of wood used annually in cooperage was $33-714,770. It is known that several million dollars worth is annually consumed in the manufacture of baskets. The chief of the forestry division of the Agricultural Bureau recites that 2,909,542 cords of bark were used in tanning in 1880, at an average cost of $6 a cord, which would bring the aggregate value of bark up to $17,457,252. This does not include the value of trees cut for bark and left to decay, and these include much the larger part of the timber devoted to this purpose. It will be observed that the bark used annually, of which we hear little mention, amounts to more in value than the rye crop, nearly as much as the whole product of iron ore, and more than half the gold taken from our mines. Even the matches we consume require wood to the value annually of $3,298,562. When the details are followed up it is no longer a mystery that the timber product of the country is so large and valuable.

Notwithstanding the substitution of iron for wood in so many ways, the uses to which wood is put increase from year to year. It is believed that not less than 160,000,000 trees have been consumed in furnishing railroad ties, thus stripping an area equal to 3,000,000 acres. This demand, for which there is no substitute, must be perpetual. The average duration of railroad ties is seven years. More than 22,000,000 ties will be required annually to keep up the railroads already constructed. It is assumed that it will require 30 years for a tree to reach the size required for railroad ties. When the demand of the railroads for wood for ties is supplemented with the demand for fuel for locomotives, the requirements from that quarter for timber are perceived to be enormous. The desire for trees for shade and such comfort and shelter as trees afford is universal. But the cultivation of timber must be placed on some ground more substantial than sentiment. It must be shown to be profitable as well as pleasant, or it will not be successfuly or generally pursued. There have been many facts cited on this subject and many guesses made, but the subject is yet in the realm of conjecture. The character of land which may be utilized, the varieties of timber which will thrive where cultivation of grain or grass is not now profitable or possible, and the climatic effects of forestry cultivation, are all questions which can on only be determined by actual experience, to be gained by observations extending through many years.

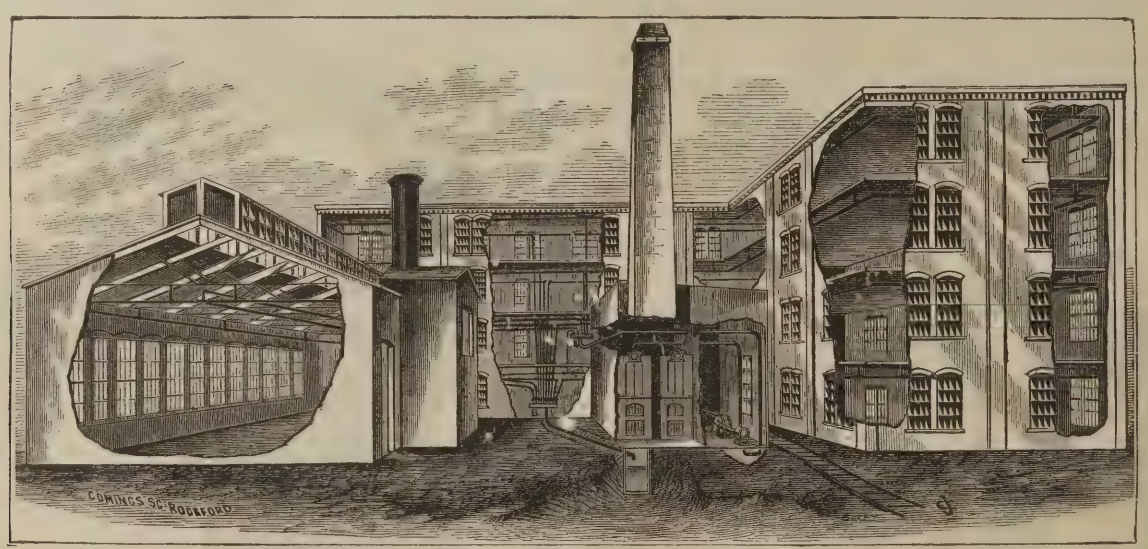
The saw, observes an exchange, was invented by Daedalus, according to Pliny, but Apollodorus says the inventor was Telus. It is stated that the latter, having found the jawbone of a snake, employed it to cut through a piece of wood, and then formed an instrument of iron like it. Becher says saw mills were invented in the seventeenth century, but this is not so, for they were erected in Maderia in 1420, at Breslau in 1427, in Norway in 1530. The Bishop of Ely, ambassador from Mary of England to the Court of Rome, describes a saw mill there in 1555. In England, saw mills had at first the same fate with printing in Turkey, the crane in Strasbourg, &c.—the attempts to introduce them were violently opposed, and one erected by a Dutchman in 1663 was forced to be abandoned.

Overhead Steam Heating for Shops and Factories.

Some time since Messrs. W. F. & John Barnes, of Rockford, Ill., introduced steam heating into their extensive works. The plan adopted, while not differing materially from systems in use elsewhere, is of interest to our readers, because it illustrates a method that may be successfully introduced in various directions. We append an extract from a letter on the subject received from this firm some time since, and present an engraving, which will convey a general idea of the method employed:

"This arrangement of overhanging pipes is often questioned as regards economy and the comfort of the workmen. We have used this system several years, and are more convinced each year that it is without doubt the best that can be adopted for factory use. We have no complaints from our workmen, and, as far as economy is concerned, we think that the record we give will hardly be equaled by any other style of heating. We can give you a report upon only one year's heating, at a time when we were using and heating 400,000 cubic feet of space, at that time not having fully completed our building. As we use the same boiler for heating that we do for generating steam for our engine, we will have to give you the amount of coal used for the combined purpose, and allow those who judge to draw their own conclusions as to the amount required for each purpose. This 400,000 cubic feet of space was heated during the year whenever it was necessary. A large part of the time the exhaust from the engine was all the steam that it was necessary to use in the pipes; during the coldest weather of the season, live steam from the boiler was turned on from time to time, as it was necessary. The pipes are arranged so that either or both can be used at the same time. The water from the condensed steam is trapped back into a hot well, and thus saved. It is pumped from this hot well through a Berryman heater into the boiler again at a temperature of about 212°. The cut shows the system of pipes as arranged for the complete circulation of steam through the different departments. Each floor has a separate feed-pipe and drip-pipes, and the whole combination is so arranged that on the first floor the engineer can at any time throw on or take off steam from any or all of the floors.

"We have run this system one year, heating the amount of space referred to, 400,000 cubic feet. We used for this heating an average of 1 ton of coal per day, that cost us on car beside our engine-room an average of $1.50 per ton. This coal is known as Illinois slack coal, or screenings. Besides heating, as described above, we run with this coal our machinery, as follows: 500 feet of line shafting, from which was driven 40 iron lathes, five iron planers, six iron shapers, 12 drills and two milling machines, and several machines for special work, besides a complete set of wood-working machinery, including surface planers, band saws, circular saws, cut-off and rip saws, &c. We have just completed an additional building that will add to the above amount of space 150,000 cubic feet. We do not see why there should not be the same economy in heating a greater space."



STEAM HEATING IN THE WORKS OF W. F. & JOHN BARNES, ROCKFORD, ILL.

TRADE PUBLICATIONS.

Wrought-Iron Ornaments.

We have received from Messrs. C. G. Eckstein, No. 32 Liberty street, New York, a very elaborate catalogue of wrought-iron ornaments suitable for use on sheet-metal architectural work, and also as trimmings for iron fences, verandas, grilles, railings, &c. They are done in black iron upon a forging press, and in dies that show the result of very artistic treatment. The line of goods is of the greatest interest to architects and builders generally, especially to those who are dissatisfied with the rough trimmings that are frequently applied to work wherein these goods would be useful.

Hand-Tools for Iron and Wood Working.

The new illustrated catalogue of the Millers Falls Company, of 74 Chambers street, New York, is a pamphlet of some fifty-odd pages. The manufactures of this company embrace a very large variety of articles, more particularly hand-tools for wood an iron working, besides vises, spirit levels and other accessories. The catalogue illustrates over 20 different styles of braces, drills and other boring tools, including drill braces, mounted breast drills, combination vise and drill, boring machine, double-crank breast drill, &c. They make vises of all kinds, the cuts showing some nine different varieties of bench and hand vises. Besides the articles enumerated, the Millers Falls Company manufacture jack-screws of from 10 to 80 pounds weight, various kinds of scroll-saws for both hand and foot power, tool-handles and other hardware articles of

a miscellaneous character. The catalogue is very profusely illustrated, and gives tables of dimensions and prices in all cases.

Frink's Reflectors.

We have received a copy of the new catalogue issued by I. P. Frink, 551 Pearl street, which is devoted to various forms of reflectors for churches, halls, dwellings, stores and other purposes which he manufactures. We have referred to the goods in the past, so that their general construction is already familiar to our readers. Reflectors are shown in this catalogue which are applicable to gas and also to kerosene lamps, and goods are illustrated from those of the simplest character up to those used in connection with chandeliers where many burners are employed. Reflectors are also shown adapted for special purposes. Some of the illustrations show reflectors used in connection with incandescent electric lights. The catalogue is accompanied by a price list, which makes it of special interest to architects and builders who require goods of this class.

Mortar.

It is commonly supposed that anybody is competent to make mortar, while, judging from the results attained, nobody seems to know much about it. Good mortar is a solid silicate of lime—that is, the lime unites with the silica or sand, thus forming a silicate of lime. In ancient days those who had some conception of the way these two materials united, superintended their mixing, and the result was mortar, specimens of which have come down to us, and which are far superior to those that we are commonly using. Dry lime and dry sand laid together or mixed and kept dry for 1000 years would not unite to form silicate of lime any more than acetic acid and carbonate of soda dry in a bottle would effervesce. To make silicate of lime just as good as was made by the Romans, all that is necessary is to proceed intelligently: Procure good caustic—*i. e.*, fresh-burned lime—and if you find it all powder—*i.e.*, air-slaked—don't use it; use only clear lumps. Slake this (if possible in a covered vessel), using only enough water to cause the lime to form a powder. To this while hot add clean sand, not dirt and loam called sand, but sand—and with the sand add enough water to form a paste. Then let it lie where it will not become dry by evaporation—in a cellar, so much the better, for as soon as you have mixed the sand and lime as above, they begin to react one on the other, and if not stopped by being deprived of moisture will go on reacting until silicate of lime (as hard as any silicate of lime ever was) is formed. But if you take this so-called mortar as soon as made and lay bricks with it, unless the bricks are thoroughly wet you stop the formation of sylicate of lime, and might as well lay your bricks in mud. Lime and sand, after being mixed, might lie two years with advantage, and for certain uses, such as boiler setting, or where the whole structure of brick and mortar is to be dried, the mortar ought to be mixed for one year before use, and two would be better; but for house building, if the bricks are so wetted as not to rob the mortar of its moisture as soon as used, mortar that has been mixed a month will form good, solid silicate of lime among the bricks it is laid with in 10 years, and will be still harder in 100 years. The practice of mixing mortar in the streets and using it at once is as foolish as it is ignorant, and would be no improvement. Silicate of lime is made only by the slow action of caustic lime and sand, one on the other, under the influence of moisture. Dry they will never unite, and mixing mortar as now mixed and using it at once, so as to dry it out and stop the formation that the mixing induced, is wrong.

Carved Panels for Bench Ends.

The great care with which details of construction and decoration are worked out in English churches and chapels is proverbial. Some of the finest specimens of ancient carving extant are to be found in English cathedrals, and many modern English buildings are not much behind the ancient structures in matters of this kind. The four panels shown herewith represent the carvings on bench ends in Mercers' Chapel, Cheapside, London, which has recently been refitted. The designs were prepared by Mr. James K. Colling, architect, also well known through his work, "Art Foliage," and were executed by Messrs. Cornish & Gaymere, of North Walsham, Norfolk. Although a small building, the original chapel was by Sir Christopher Wren, and the old carving displayed in it, as well as the reredos, is said to be from the hands of Ginling Gibbons. The chapel occupies the position of the chancel of a former church. The whole building was burned down in the great London fire in 1666, but some of the original walling of the former church can still be seen. In restoring the chapel all the old carving has been scrupulously preserved, and that which has been added has been carried out in the same style. The old oak has also been reused wherever found practicable. On three sides of the chapel carved oak stalls have been added, with benches having carved ends, in the body of the chapel. Our illustrations show four examples of ornamental panels from these bench ends. The designs are interesting to our readers, not only as being of possible application in modern work, but also as illustrating in some measure the character and style of ancient carving. Although our engravings are very much reduced from the size of the original work, the design is well preserved and the general effect well shown.

PANELS FROM THE BENCH ENDS, MERCERS' CHAPEL, CHEAPSIDE, LONDON, ENGLAND.

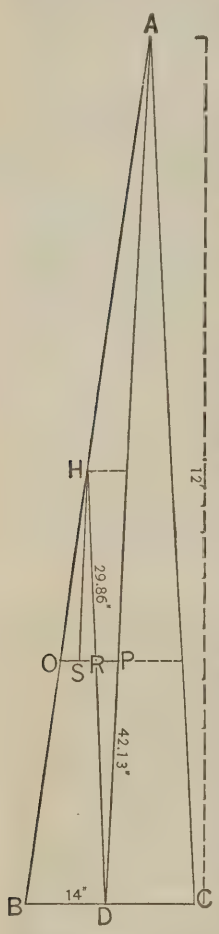
James K. Colling, Architect.

CORRESPONDENCE.

Problem in Board Measure.

The problem in board measure presented in our issue for October of last year in the following terms, "Given, a board 12 feet long, running to a point at one end and 14 inches wide at the other, of even thickness throughout. Required, the exact distance of a line parallel to the broad end, which shall cut the board so as to leave the same amount of lumber in each end," has attracted wide attention. We presented a number of solutions in our December issue, and now add still others:

From L. S., *Peru, Ind.*—The problem in board measure as presented some time since was given to me a few years ago. I examined it at that time, and concluded there was no way of arriving at a solution. I held this opinion until I saw it presented in the paper by "H. J. R.," with an intimation from the Editor that it could be worked out. Thereupon I went to work in order to determine the means. The following is the result I have reached: Referring to the accompanying sketch, let *A B C* represent the board. Draw a line, *A D*, dividing the board lengthwise into two equal parts. Draw a line from *D* to *H*, which, it will be readily seen, divides the left half of the board into two parts of equal area. Next draw the line *O P* parallel with the base of the board, and at such a distance from the end that the triangle *R P D* will have the same area that is contained in the triangle *R O H*. It is an established truth in geometry that all similar surfaces or areas are to each other as the square of their like dimensions. From this it follows that like dimensions are to each other as the square root of their areas. By this rule we find where to draw the line *O P*, which is to be the center of the board. Draw *H S* longitudinally through the center of the triangle *R O H*, making two right-angled triangles out of it the same shape, and the two together of the same area as contained in the right-angled triangle *R P D*. By the rule above stated I find the length of the triangle *R P D* and of *H S R*, which would properly be termed the base. The length of the base of both these triangles, it can be readily seen, is 6 feet. Now, by applying the rule and making the calculation, we find that the base of the triangle *R P D* is $42\frac{13}{100}$.



The Problem in Board Measure as Solved by L. S.

From C. E., *Monroe, Wis.*—The area of similar triangles are to each other as the squares of their corresponding sides. In this case the triangle cut off will be similar to the larger triangle, and it will be half the area of the large triangle. Therefore, the square of the length of the whole board is twice the square of the length of the triangular piece to be cut off. The square of 12 feet is 144; therefore, 144 divided by 2, or 72, is the square of the corresponding side of the triangular piece. The square root of 72 is 8.485, the length of the triangle cut off. Therefore, the piece will be 12 feet minus 8 485 feet equals 3.515 feet, or $42\frac{13}{100}$ in length. In conclusion, it is scarcely necessary to say that all students of geometry in our schools find such problems as this one very easy of solution. It is much to be regretted that so many skillful mechanics did not have the opportunity of equal advantages in their younger days.

From C. A. Y., *Yorkville, Toronto.*—Referring to the accompanying sketch, we know that *A D* equals 144 inches, and that *B D* and *D C* each equal 7 inches. Accordingly, the part cut off from *A D C* will be similar in shape to it. Let x equal the part cut off from *A D*. Let y equal the perpendicular from the point to *A C*—that is, the base of the smaller triangle and which in the figure would lie parallel to *D C*. Then $x\,y = \frac{1}{2}(7 \times 144)$. $x\,y = 504$. We also have $x : y :: 144 : 7$. From this $7\,x = 144\,y$ or $x = \frac{144\,y}{7}$. From the preceding we obtain $\frac{144\,y^2}{7} = 504$. By substituting $\frac{144\,y}{7}$ for x in $x\,y = 504$, we obtain $x = 101.81$ and $y = 4.95$. Subtracting the value of x from 144 inches we find that the required line should be drawn 42.19 inches from the base.

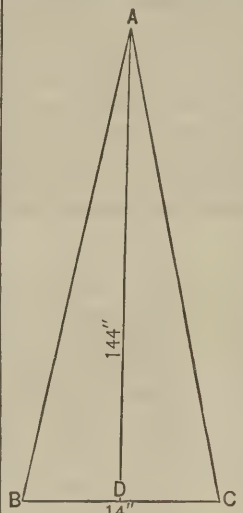


Diagram Contributed by C. A. Y.

From W. S., *Penn Yan, N. Y.*—I suggest the following rule: Extract the square root of ½ of the square of the length of the board, and the result will be the length of the piece, measuring from the point of the board. The problem worked by this rule will make the length of the piece cut off, measuring from the small end, 8 feet $5\frac{10}{12}$ inches, as nearly as is practicable to measure, or the length will be 3 feet $6\frac{2}{12}$ inches, measuring from the wide end.

From T. J., *Bismarck, Dak.*—The whole board and the piece with the pointed end are similar triangles, the area of one being twice that of the other. Similar plane figures are to each other as the squares of their corresponding sides. Taking the perpendicular hight of the board in inches, and allowing x to stand for the length of the piece with pointed end, we have the following proportion: $144^2 : x^2 :: 2 : 1$. Then 144^2 equals x^2 multiplied by 2. x^2 equals 144^2 divided by 2. x^2 equals 10368. Extracting the square root we have x equals 101.8233 ×. This is the length of the piece with the pointed end, and subtracting this length from 144 inches we have 42.1766 as the distance of the line from the broad end of the board.

From G. M., *Shelbina, Mo.*—Let *A* be the point at which the line parallel with the base is to be drawn. Let x equal the distance from the small end to A. It is evident that the width at *A* would be $\frac{14\,x}{144}$. Then, $\frac{x}{2}\left(\frac{14\,x}{144}\right) = \frac{1}{2}\left(\frac{144\,x\,14}{2}\right) = 504$. From this we find that $x = 101.82$ inches, and that $144 - x = 42.18$.

From B. F. C., *West Pittston, Pa.*—I read with pleasure the solution from "H. S. K.," Watsontown, Pa. Although his method of solving the problem differs very materially from mine, I think that they are both correct, and that the answer is right. As "H. S. K." invites discussion on his method, I would suggest that he can improve on it by taking the same geometrical principal conversely, making it read: "The areas of similar plane figures are to each other as the square of their like dimensions." Now, the area of the smaller triangle is one-half the area of the larger, or they are to each other as 1 to 2, and, by the given rule, gives the proportion $2 : 1 :: 144^2$ inches: ( ). As the area of the larger triangle is to the area of the smaller, so is the square of the altitude of the larger to the square of the altitude of the smaller triangle. Solving the proportion gives 10368, and $\sqrt{10368} = 101.823 +$ inches as the altitude of the smaller triangle or distance from the small end that the board should be cut. It will be readily seen that this shortens the work by saving the labor of extracting the square root of one number and the handling of large decimals required in "H. S. K.'s" solution.

From G. W. H., *Englewood, Ill.*—I find the answer to "H. J. R.'s" problem to be 48 inches. I don't think he will find a rule that applies to the case. Inclosed find my method of solution:

x = length of required line.
y = distance from wide end.

(1) $\left(\frac{14 + x}{2}\right)y = 504$ (½ area of board).

(2) $\left(\frac{144 - y}{2}\right)x = 504$ (½ area of board).

From (1) $y = \frac{1008}{14 + x}$

From (2) $y = \frac{144\,x - 1008}{x}$

(3) $\frac{1008}{14 + x} = \frac{144\,x - 1008}{x}$

From (3) $x^2 + 7\,x = 98$

$x = 7$

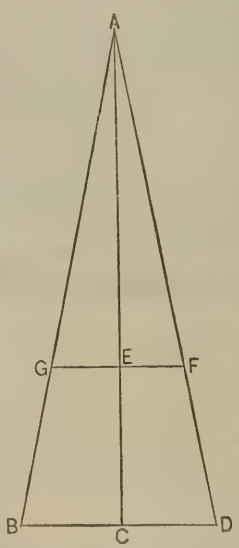
Substituting value of x in (1)

$\left(\frac{14 + 7}{2}\right)y = 504$

$y = 48.$

Note.—This correspondent may come to a different conclusion in view of the different rules and results presented herewith.

From J. H. L., *Council Bluffs, Iowa.*—I submit my solution of the problem, hoping that others may also do the same, and that thereby we may be enabled to compare notes and to determine the best method of solving such a problem. Let *A B D* in the accompanying sketch represent the board. Draw the perpendicular *A C*, and also the line *G F*, representing the place where the board must be cut. This gives us two right-angled triangles, *A C D* and *A E F*, with the base and perpendicular of the larger one known. As will be readily seen, the area of *A E F* is half of that of *A C D*. The homologous sides of all right-angled triangles are proportional. The perpendicular *A C* of the larger triangle is 144 inches and the base 7 inches. The proportion of the perpendicular to the base would then be $\frac{144}{7}$. The perpendicular of the smaller triangle *A E F* will bear the same proportion to its base *E F*. The area of *A C D* is ½ of 144 × 7, or 504 square inches. The area of *A E F* is half as large, according to the proposition. In other words, the perpendicular *A E* multiplied by the base *E F* would give twice its area, or 504 square inches, and *A E* being $\frac{144}{7}$ of *E F*, as above shown, gives the following equation: $\frac{144}{7} \times E\,F = 504$, or $\frac{144}{7} \times (E\,F)\sqrt{E\,F} = 504$. Now, then, if we di-

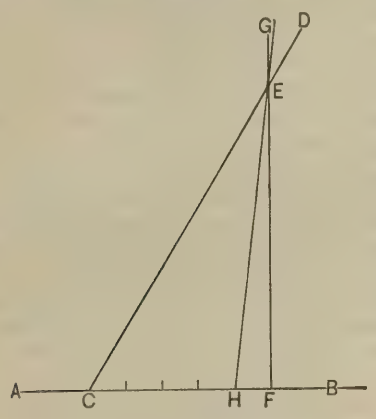


J. H. L.'s Solution of the Board Problem.

vide 504 by 14¼, the quotient will be the square of the base *E F*. The square root of this will be the length of the base *E F*. 504 ÷ 14¼ = 24½. The square root of this is 4.94 inches. Now, as the perpendicular *A E* is 14¼ multiplied by the base *E F*, multiplying the base 4.94 by 14¼ gives *A E*, which we find to be 101.62. This subtracted from 144, the length of *A C*, gives 42.38, the distance from the bottom at which the board must be cut.

Hopper Bevels.

From L. S. H., *Bolivar, N. Y.—Carpentry and Building* for October was the first number of the journal that I have seen. In it I

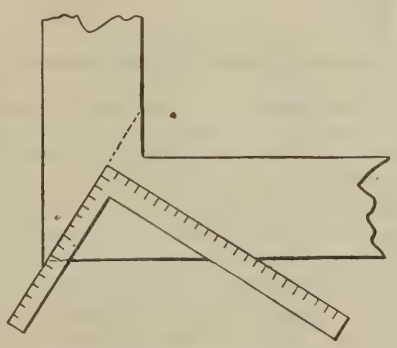


L. S. H.'s Rule for Hopper Bevels.

notice an article on hopper bevels from "C. M. R.," Wheeling, W. Va. He writes as though the subject had been pretty well exhausted in previous numbers. Just what has appeared, however, I do not know, but I will venture to submit a rule that may be new to some readers of the paper. I find that the bevel of the butt joint is always one-fifth of the main bevel. The accompanying diagram illustrates what I mean. Draw a line, C D, at the same angle with the straight edge of the board A B that the sides of the hopper are to stand. Cut this line at any point, E, with a line, F G, drawn at right angles with A B. Divide C F into five equal parts, and through the fourth point thus established draw a line as shown from H, cutting E. Then H E will be the bevel of the butt joint.

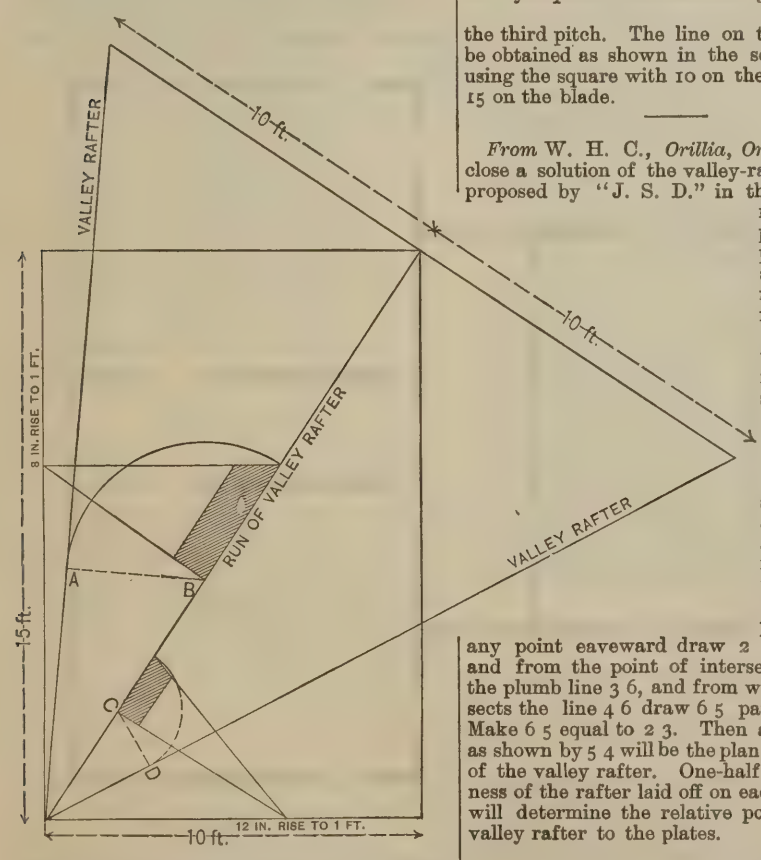
Valley Rafters.

From W. B. M., *Bay Shore, L. I.*—To answer the question propounded by "J. S. D.," with reference to valley rafters between roofs of different pitches, and which was published on page 223 of the issue for November, I will suppose that the half width of the roof having a pitch of 45° is 10 feet. I will also suppose that the other roof is one-third pitch. Accordingly, it will take 15 feet of it to make an equal rise. By the conditions of the problem we then have a rectangle 10 x 15 feet by which to get the length of the valley rafter sought. A line drawn diagonally through this rectangle will give the run of the valley rafter. Lay off at right angles each way from the diagonal a distance equal to the rise, and connect it as shown in the diagram. This will give the length of the valley rafter. Let fall on each side of the diagonal a perpendicular equal to the half width of the rafter terminating at the sides of the figure. From B and C thus established let fall perpendiculars B A and C D from the line of the valley rafter. Then A B will be the backing or distance above the edge of valley to set the jacks for the 45° pitch, and C D will be the hight above the edge of valley to set the jacks for



Use of Square as Described by W. B. M.

the third pitch. The line on the plate will be obtained as shown in the second figure, using the square with 10 on the tongue and 15 on the blade.

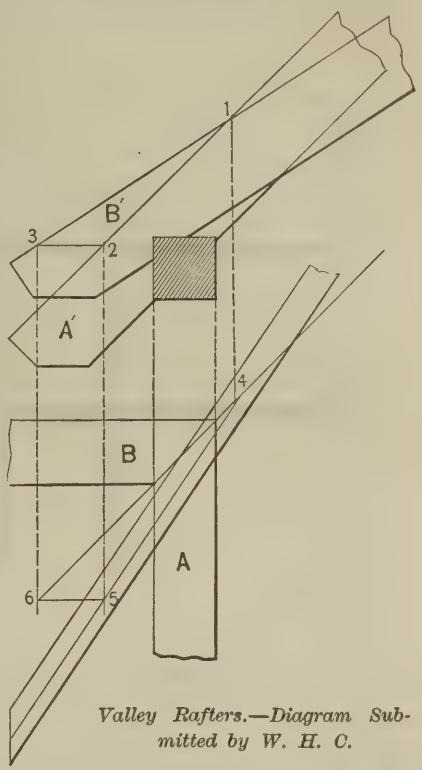


Valley Rafters.—Diagram Accompanying Letter from W. B. M.

From W. H. C., *Orillia, Ontario.*—I inclose a solution of the valley-rafter problem proposed by "J. S. D." in the November number. The plan of the plates is A B and the corresponding rafters A' B'. Where the top lines of rafters intersect, marked 1 on the elevation, drop a plumb line 1 4, to intersect 4 6, made at an angle of 45°, and passing through the internal angle of the plates. At any point eaveward draw 2 3 horizontal, and from the point of intersection 3 drop the plumb line 3 6, and from where it intersects the line 4 6 draw 6 5 parallel to 2 3. Make 6 5 equal to 2 3. Then a line drawn as shown by 5 4 will be the plan of the center of the valley rafter. One-half of the thickness of the rafter laid off on each side of 4 5 will determine the relative position of the valley rafter to the plates.

Fastening Hand-Railing.

From O. W., *Philadelphia.*—In answer to the inquiry from "E. S.," a short time ago, as to the best method of fastening hand-rails to the newels, I would state that my experience has demonstrated that bolting them with hand-rail screws is the best method that can be employed. There is very little or no shrinkage under these circumstances, and this plan can be employed much quicker and will make a better and stronger job than mortising the rail into the post. Particularly is this the case where the rail meets the post



Valley Rafters.—Diagram Submitted by W. H. C.

at an angle. Either single or double screws can be used. Which of the two is best can be determined by the necessities of the case. On a rake or where I can get my hand into the post to insert a bolt I use single screws, turning a thread into the post after the rail has been fitted. I then make a mortise for the bottom of the rail and make a slot from that to the end just large enough to receive the bolt and to turn the nut on at each end, thus dropping the rail down over them and tapping the nut up. When I can get a nut on the inside of the post I dispense with the slot and bore into the rail far enough to let the bolt in past the hand. I put a hole in the rail opposite the one in the post, and then slide the bolt forward from the mortise in the bottom of the rail. I then put the nuts on and tap them up. The mortise and slot are covered up by the filling between the balusters, or, in case this construction is not employed, they may be obscured by plugging. If the rail is fitted nicely and bolted up tightly it will always remain so. The only chance for shrinkage is in the space between the mortise and the inside of the post. This would be less than 4 inches, and three-quarters of this material would be lengthwise, a direction in which there is practically no shrinkage.

Removing Ink Stains from Ivory.

From D. D. H., *Bedford, Pa.*—In reply to an inquiry published some time since, as to how ink stains can be removed from ivory, I would say that salts of lemon will have the desired effect.

Tool-Chest.

From F. L. M., *West Winstead, Conn.*—As I am about to build a tool-chest, and, as I desire it as convenient as possible, I would consider it a favor if some of the readers of *Carpentry and Building* would submit plans of their chests. If plans of chests have been submitted in the past, please give me the dates.

Answer.—The subject of tool-chests for carpenters' use received attention from numerous correspondents in our volume for 1880. A number of designs will be found in the issues for May and June of that year.

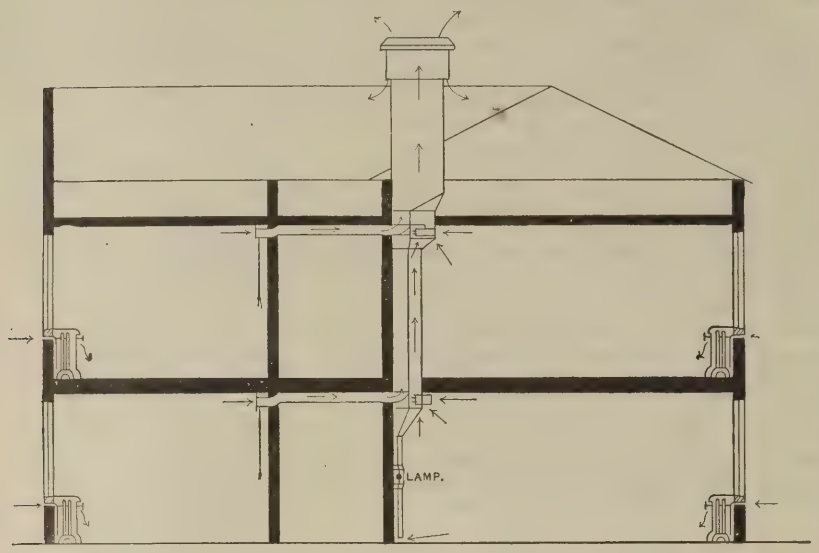
The Ventilation of a Schoolhouse.

From HENRY A. GOUGE, *New York.*—In your issue for November you have a communication from "J. M. G. & Co.," Mount Pleasant, Ohio, with a plan of a schoolhouse which they say they would like to ventilate. They go on to say the rooms will seat 45 to 50 students each, and that they would like to know if pipes 10 x 20 inches from each room, as they are indicated on plan, will be large enough, &c. The Editor's note appended to this letter is as follows:

"The problem presented by these correspondents is one, perhaps, that may be profitably discussed by all who are engaged in the work of heating and ventilating. Two of the rooms in question are 24 x 28 feet in plan, with a ceiling hight of 12½ feet. These rooms have a cubic capacity of 8400 feet. A pipe of the size named by our correspondent has a capacity of 200 square inches on a little more than 1¼ square feet. Our correspondents do not say how the draft through these ventilating-pipes is to be maintained, and, judging from their plan merely, we are justified in inferring that no artificial draft is contemplated. Under these circumstances we regard the system altogether inadequate. The system will be a failure, irrespective of the size of the pipes, unless a strong draft is created in them by artificial means. Perhaps some of the practical ventilating engineers among our readers will see in this scheme an opportunity of reading a lecture to those who are engaged in this class of work without knowledge or experience, and if they choose to furnish us specifications of the thorough ventilating of the building we shall take pleasure in publishing them. We should mention that these correspondents hardly give enough particulars concerning the plan they propose to use to enable any one to pass an intelligent opinion upon it. They do not indicate where the ventilating-pipes are to open, although the inference is that they open near the floor. They do not indicate, either, where the fresh air is to be derived, although we may infer in this case that it is taken at some point near the stoves, the latter being located at opposite sides of the rooms from the ventilating-pipes. We shall be glad to see this question carefully considered by our readers."

The above seems pertinent and fair, and I will try to add my testimony and experience to help to solve the problem. You give the cubic capacity of the rooms, also the capacity of the exhaust-pipe, which is quite simple, but to adjust a pipe that will take out a given quantity of air in a given time is quite difficult. Air is a substance that requires a power to move it, and it cannot be moved unless a power is provided, and also means adopted for other air to take the place of that removed. I find many scientists figuring on the cubical contents of rooms and floor space of schoolrooms. This will do, so far as the seating capacity of the room is concerned. A high ceiling is very good for light, but has nothing to do with the ventilation. A room with a 7-foot ceiling can be as perfectly ventilated as one with 14-foot ceiling.

What is ventilation? Ventilation, as I understand it, means the admission of a sufficient quantity of fresh air to an inclosure for the purposes required, and the exhaustion of the vitiated air as fast as generated. The amount of fresh air to be admitted to a room, we will assume, is 10 cubic feet per minute for each person. This is ample for the purpose of respiration. The room holds 50 students; 10 feet per minute each will be 500 cubic feet per minute to be admitted and exhausted in order to keep the room well ventilated. If this is done, no noxious gas can accumulate, because it is carried off as fast as generated; consequently, it does not make any difference whether the room is large or small, so far as ventilation is concerned. So much for the fresh and foul air; but ventilation means something more than admitting fresh air and exhausting the foul. It means a heating apparatus that is under control for the purpose of warming this quantity of fresh air to a proper degree of temperature to make the room comfortable in the seasons of the year when heat is required. As rooms are not all on the south side of the building, but some are on the north side, it requires more heat in the north than on the south to make the rooms of the same temperature. What would make the north room comfortable would make the south room very uncomfortable, and *vice versa.*



Ventilation of a Schoolhouse.—Fig. 1.—Longitudinal Section Through Building.

The accompanying cuts will illustrate the principle upon which any building can be perfectly ventilated and heated. The inlet device will show how a large quantity of fresh air can be admitted to a room without producing drafts. The heating apparatus must be so arranged and of sufficient power to heat the quantity of air to a proper degree of temperature before it enters the room. This can be done by steam, hot water, furnace or hot air, gas, oil or wood stove. Now, for the other part—namely, the exhaust—there must be a shaft of sufficient capacity with a motive power to exhaust the quantity of air from the room to keep it free. It will be seen that this exhaust shaft is increased in size as it runs up, and as openings are made into it from the various rooms the main shaft is increased in size just the number of square inches contained in each of these openings. This is a two-story building, and I have marked the sizes of openings in the classrooms, which will be ample provided the work is nicely adjusted both inside and out. Badly-adjusted ventilating apparatus is really worse than noneat all, for reasons that can be easily explained. We hear of cases frequently where the improper application of ventilating apparatus is the cause of almost instant death, but generally it is a slow process of poisoning which few are conscious of until it is too late. The floor plans, Fig. 2, show the openings and branch-pipes from the different rooms and halls, and how they are connected with the main shaft under the ceilings in each story.

The elevation, Fig. 1, shows the exhaust shaft located in one corner of the building, starting from near the floor of the first story with a pipe, the area of which is 36 square inches, that runs up into the bottom of a lamp in which gas or oil is burned, as may be most convenient. Above the lamp the pipe is contracted to concentrate the current of heated air that is shot up into the bottom of the enlarged main shaft and across the mouths of the several openings, thus inducing a rapid flow of air through each opening and branch-pipe, into and up through the main shaft. The combined areas of the outlets from the three classrooms and two halls is 712 square inches on each floor. The main shaft is equal to this under the first-story ceiling, and this size is carried up through the ceiling and floor until within about 2 feet of the second-story ceiling, where it is again enlarged 271 square inches, making it at this point equal to 1424 square inches, being the combined area of the two stories, and is carried out this size through the roof, first, however, changing its shape from a corner pipe under the ceiling to a rectangular pipe between the ceiling and the roof through which it passes in this form, and is carried above the roof a sufficient hight to insure it against counter currents of air, the cap or head protecting the shaft from all down drafts, storms, &c., and insuring in all cases a steady and uniformly strong up draft.

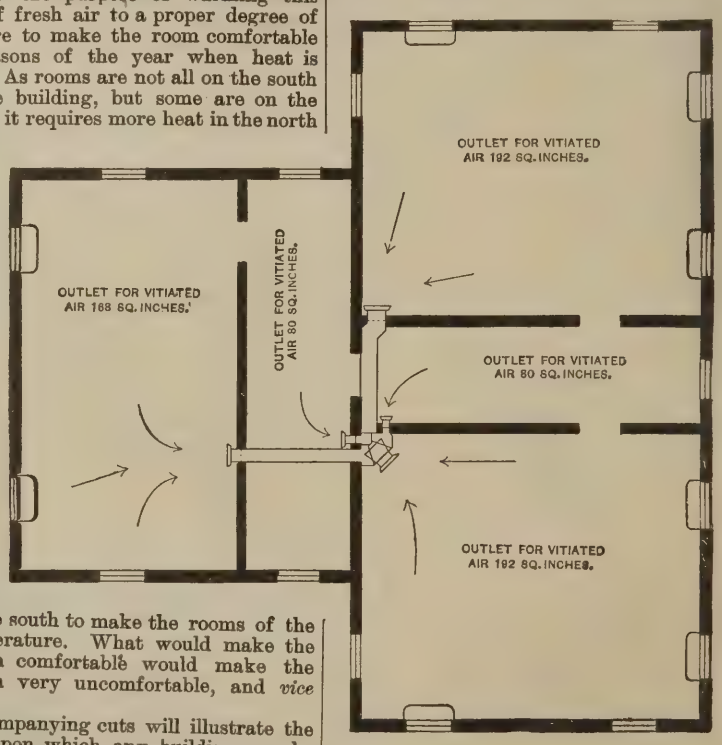
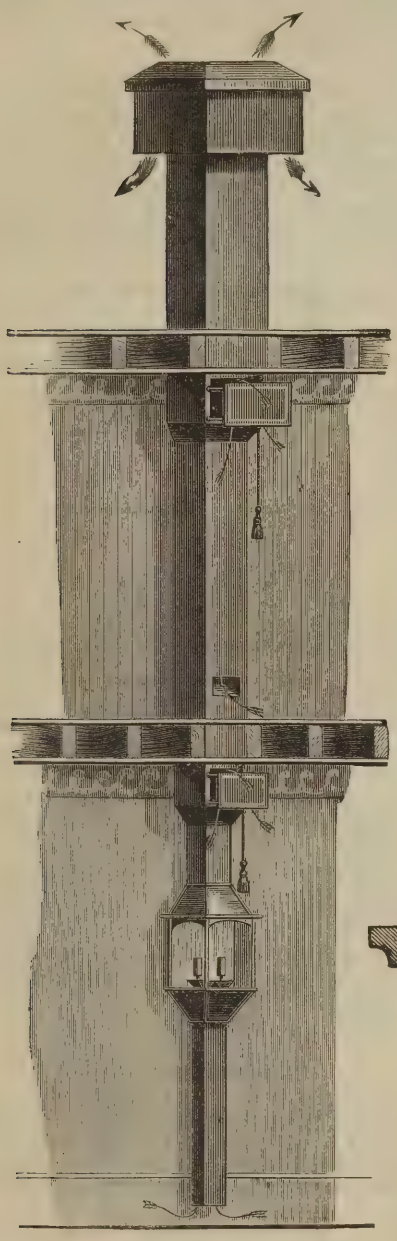

OUTLET FOR VITIATED AIR 192 SQ. INCHES.
OUTLET FOR VITIATED AIR 168 SQ. INCHES.
OUTLET FOR VITIATED AIR 80 SQ. INCHES.
OUTLET FOR VITIATED AIR 80 SQ. INCHES.
OUTLET FOR VITIATED AIR 192 SQ. INCHES.

Fig. 2.—Floor Plan.

The drawings show heating by steam, which is preferable in a large building, but a building of this size and shape can be heated by a furnace much cheaper than by steam. The furnace must be properly constructed to

prevent the burning of the air, and should be strictly gas-tight. The fuel to be used is of no consequence, provided it will produce sufficient combustion to warm the quantity of fresh air to a proper degree to make the rooms comfortable. The drawings also show the openings for exhausting the vitiated air to be near the ceiling, which is correct. The theory that carbonic-acid gas



Ventilation of a Schoolhouse.—Fig. 3.—Detail of Ventilating-Pipe.

retires to the floor in an illy-ventilated room is not sustained by any test known to science.

Note.—In addition to the engravings made from the drawings furnished us by Mr. Gouge we present two cuts from a work on ventilation issued by him some time since, which better illustrate the principles and construction above referred to. One of them, Fig. 4, represents the manner of introducing fresh air about steam radiating coils located underand in front of a window, and the other, Fig. 3, shows details of the ventilating-pipes which Mr. Gouge would use in such work as above described.

Storing Power.

From X. Y., *Gault, Ontario.*—I wish to run two or three small machines in my shop, such as a jig-saw, a lathe and a rip-saw. I do not require these machines all the time, but would like to use them perhaps one day a week, or one or two hours in a day. I want to know if I could not store power sufficient to operate this machine by using a windmill to raise a weight which should be employed as a motor upon some plan analogous to that used in old-fashioned clocks.

Answer.—Our correspondent's suggestion seems very plausible on the face of it, and yet we do not know of any case where an experiment of this kind has been attended with practical results. It would be somewhat difficult in the space at our command to point out the exact reasons why such attempts have not proved successful, or to show the difficulties in the way of accomplishing what our subscriber desires. The question of storing power is at present agitating mechanical engineers in various parts of the world, and much attention is being given to it. The storage of electricity is one phase of it, while schemes for using a number of windmills as an auxiliary to steam-power or water-power have also received some attention. We believe that no results have yet been reached to warrant the belief that power can be stored upon a small scale with economical results by appliances at present in use. Probably one difficulty, at least, which our correspondent would encounter in case he attempted to carry out his experiment in the manner he suggests would be that of arranging a weight large enough or to move through a space great enough to answer the purposes specified. He requires considerable power and his machines run at high speed. The question is an interesting one, and we shall welcome communications upon the general subject

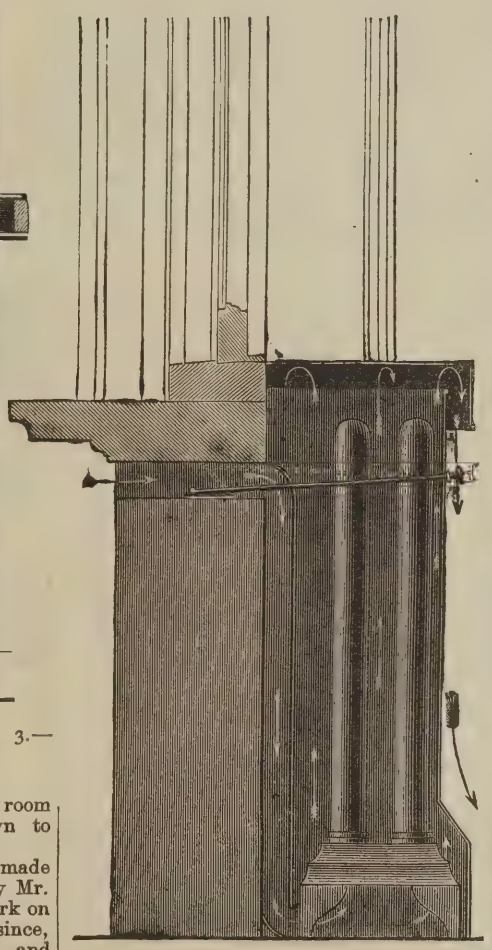


Fig. 4.—Manner of Introducing Fresh Air Around Steam Radiators.

from our readers. Storage of power in other directions is very common. The ordinary mill pond of our villages is a conspicuous illustration. Many windmills are employed for pumping water to reservoirs on hillsides, from which pipes in turn lead to houses. The water in some instances is under sufficient head by this means to operate small motors adapted to running churns, sewing machines and other forms of light machinery. We do not know of a case, however, where storage of water raised by a windmill has ever been attempted upon as large a scale as our correspondent would require.

Southern Houses.

From L. P., *Sandford, Fla.*—I have been an interested reader of *Carpentry and Building* for some time past. I have been looking through the numbers in my possession for hints that would help me to design a house for such a climate as that of Florida. We do not want fires usually, but there are a few days in the year when we require them. We want air, plenty of ventilation and more halls and porches than are ordinarily employed about buildings erected in the North. We also need a lighter kind of finish. I am forced back on myself, but probably cannot please myself as well as some architect could, provided he could make use of the experience I have had living 10 years in Southern Florida. In midsummer our halls are the places most used. In winter our porches are most in demand. Our woods are very fine and should never be covered with paint. Our finish should be simple, with little molding work or places to hold dust. We separate our kitchens from the main house by an open porch. Could there come among us an architect who was able to comprehend the want of this country it would be a boon to the community, and I think an advantage to him. He would find more variety in the yellow pine in color and grain than in any other one wood that I have ever examined. Some of the yellow pine is very light, and some almost as red as mahogany. It seems peculiarly well adapted to the intense light of this climate. Our country is flat, and we want elevation. We want air in summer, and yet we need as much as possible to shut out the glare of the sun. Windy days in summer are luxuries.

Note.—We refer this communication to our readers as a very satisfactory exposition of the wants of those who build houses in the South. Our correspondent may be somewhat assisted in working out the problem upon which he is engaged by examining the design by Mr. Chamberlain, published in the December number of *Carpentry and Building* for 1881.

Construction of Blackboards.

From J. E. C., *Corryville, Pa.*—In answer to "J. Q. B.," of Michigan, with regard to blackboards, I would say that I have had a large experience in the construction of work of this kind, and have tried almost everything that is in use for the purpose. The best material that I have yet found is as follows: Take wide boards ⅞ inch thick, and groove both edges that are to be joined together, making a groove ¼ x ½ inch. Then make a tongue ¼ x $\frac{15}{16}$ inch. Clamp the boards with door-clamps, and put three or four strips 4 inches wide on the back, screwing them with screws. Next construct a chalk tray, say 3 inches wide from the face of the board. Finish by running a nosing around the board 2¼ inches wide. Sandpaper the board very smooth with fine paper, then paint with drop black mixed with dryer and spirits of turpentine. Do not use any oil. After the board is dry go over with fine sandpaper and then give it two coats of black liquid slating, a material that can be got at any place where school furniture is kept.

From A. P. B., *Slatington, Pa.*—I notice in the issue for November last an inquiry from "J. Q. B.," for information as to the best methods and the best materials for constructing blackboards for public schools. Allow me to say for his benefit, and for the benefit of the readers at large, that the blackboard of the future is the slate blackboard, manufactured out of dark blue or black slate quarried in the Lehigh district of the Pennsylvania slate regions. From an economical point of view, there is nothing superior to slate for the purpose named, from the fact that it requires no renewal, no paint, and no repairs after it is once put up. The first cost is very reasonable. Among additional advantages may be mentioned the following: Slate always presents a smooth, clean surface. It is of uniform quality throughout its entire thickness, and it never warps. It has a dull, not a metallic, luster. Slate blackboards are manufactured in sections of convenient length from 3 to 4 feet wide and from ¼ to ⅜ inch thick. These

sections are jointed so as to fit perfectly, and are adapted to suit any space in the schoolroom. The boards are finished ready to be put in place, boxed and shipped to all parts of the United States.

Arrangement of Rooms.

From H. W. C., *South Bend, Ind.*—I send you a sketch of a floor-plan arrangement in answer to an inquiry from "J. H. L.," of Zion's Grove, Pa. I also send front and side

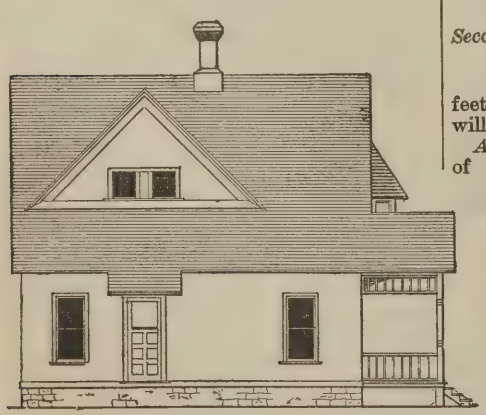
Arrangement of Rooms.—Front Elevation Submitted by H. W. C.—Scale, $\frac{1}{16}$ Inch to the Foot.

elevations, which I have drawn to correspond with the floor plan referred to. I shall be glad if what I have sent is of service to the correspondent and of interest to the readers of *Carpentry and Building* generally.

From R. R. J., *Olyphant, Pa.*—I submit a plan for general inspection in answer to the inquiry of "J. H. L.," of Zion's Grove, Pa. As will be plainly noticed, I have made some alterations from the outline originally given by him. I have changed the cellar way from the pantry or closet to the vacancy under the stairs. I have also transposed closets on the second floor. The chimney has been so located as to receive the stove-pipes from the three rooms. For my part I would prefer having the stairs on the left side of the hall, for by this arrangement a fair-sized arm might be obtained over the foot of the stairs.

Kerfing Moldings.

From J. P. R., *Scranton, Pa.*—The following method for kerfing moldings will perhaps be of value to "W. R. W.," of Cambridge, Ohio. First lay out the circle on the floor or on a sheet of paper, as the case may be. Lay it out either full size or to a scale.

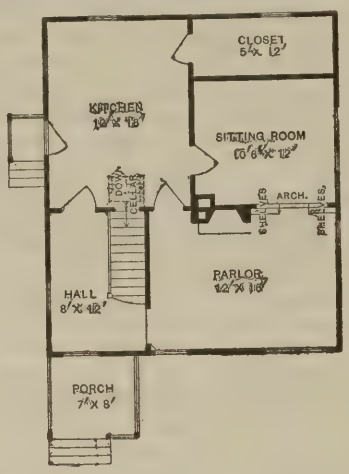


Side Elevation by H. W. C.—Scale, $\frac{1}{16}$ Inch to the Foot.

Cut the back of the required molding, and place the cut on the center of the circle, and move the outer part on the circle until the cut comes together tight at the center. Cut the distance that the outer end has moved along the circumference of the circle. This distance will be the exact length of the cuts necessary to be made.

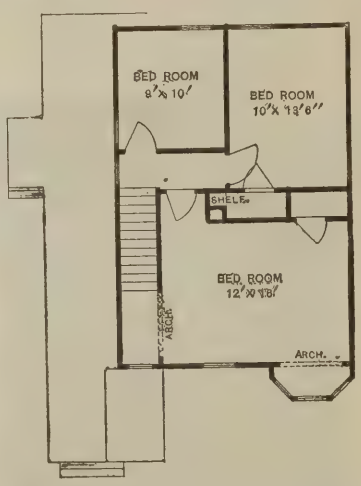
Fire-Proofing.

From W. T., *Goliad, Texas.*—Will you please give an opinion concerning the points named below. My warehouse is of the va-



First Floor Plan by H. W. C.—Scale, $\frac{1}{16}$ Inch to the Foot.

riety known as "California build." It is inclosed by inch boards running up and down. Would you consider it to be more fire-proof to take off the lathing which is now nailed on to the inch boards and replace it by common No. 26 iron on the boards, or would you think it more fire-proof if the inch boards were taken away and their place supplied by sufficient studding to which to nail No. 26 corrugated iron, it also being sealed with corrugated iron? At present the nearest building to me is 12 feet



Second Floor Plan by H. W. C.—Scale, $\frac{1}{16}$ Inch to the Foot.

feet away, but I cannot tell how soon there will be one put up close to me.

Answer.—We have never had the pleasure of inspecting a warehouse of the kind mentioned by this correspondent, namely, "California build." We have no very distinct idea as to its features. We infer from our correspondent's letter, however, that the walls of this building consist simply of inch boards, with sufficient framing to carry them. At present the building, we understand, is finished on the inside, by lathing directly against these boards and then plastering. If the fire against which our correspondent desires to protect his building were to occur inside of the building we should regard the lath and plaster as much of a protection as plain sheet iron used in the manner named. On the other hand, the plastering is no protection whatever from a fire occurring outside of the building. The construction last named—that is framework against which corrugated iron can be nailed—is one in very common use for warehouse purposes, and unless the exposure is too severe it seems to answer a desirable purpose. Our correspondent at best cannot make his building absolutely fire-proof with any of the materials he names. A judicious use of them, however, will render it less likely to burn under ordinary circumstances than one built with no thought. We are inclined to the employment of corrugated iron of the two plans named. A brick warehouse, however, if it is to be obtained, is more desirable.

Carrying a Stick of Timber.

From J. W. B., *Ainsworth, Iowa.*—Will you please inform me where I should place a hand-spike in the case of three men carrying a stick of timber, so that each man may carry one-third of the load. Assuming that the stick of timber is 12 feet long, I would like to know how to figure out the proper place

First Floor Plan Submitted by R. R. J.—Scale, $\frac{1}{16}$ Inch to the Foot.

for the hand-spike as above described, the third man carrying at one end of the timber.

Answer.—This and other similar questions were very thoroughly discussed in the volume of *Carpentry and Building* for 1881, and, as the topic was practically exhausted at that time, it seems hardly expedient to devote further space to it now. Accordingly, we refer our correspondent to the volume named.

Chisel-Pointed Nails.

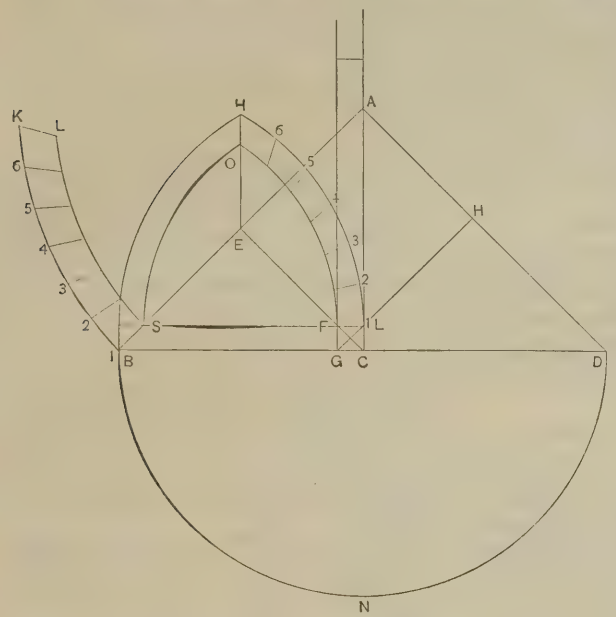
From C. J. W., *Reade street, Mich.*—In answer to "H. S," whose letter was published in the June issue of *Carpentry and Building*, I would say that 13 years ago I superintended the erection of a large school

Second Floor Plan by R. R. J.—Scale, $\frac{1}{16}$ Inch to the Foot.

building in Canada. All the nails used in this building were chisel-pointed. They were obtained from a local hardware firm, and were manufactured in the United States, but just where I am unable to say. I have made frequent inquiries for chisel-pointed nails since that date, but have never succeeded in finding them.

Splayed Jambs.

From J. R. L., *Chillicothe, Mo.*—My delay in answering the criticisms of "J. D. A." was owing to absence from home. I justly deserve the criticisms that he offers. The offense was simply a piece of carelessness. After writing the description of the diagram I noticed the imperfection and corrected it, making another drawing to take its place, but, by a singular fatality, sent the wrong



Splayed Jambs.—Diagram Accompanying Letter from J. R. L.

one, after all. If not trespassing too much upon space and patience, I will now submit what I think will set things right. First allow me to thank "J. D. A." for his timely warning to those readers who may have used the wrong diagram. I also desire to state that the drawing in question was in fault in still another particular. It gave no way of fitting into position. With reference to the lines F S and B C named by "J. D. A.," I would say that they represent the splay of the jambs. As misery loves company, I may point out that the diagrams of "G. W. P.," in the August number, and "J. V. H. S.," in the September number, are at fault in the same particular. Referring to the accompanying sketch, from the points F and S, with F S as radius, strike the arcs for the head of the opening. In like manner strike the second line representing the splay. Then we have the arcs B H, S O, F O, &c., representing the curved jambs. B S and C F represent the foot of the veneer. Extend B S. On B C at C erect a perpendicular cutting B S extended in the point A. With A S and A B as radii, strike the arcs B K and S L. Divide L H into any convenient number of equal parts, in this case six. In like manner divide F O into the same number of equal parts. Set off corresponding spaces in B K and S L. The line K L will form the joint at the apex of the arch, while the other lines drawn across the piece will be the direction of the cuts for bending. I prefer to make these with a ¾-inch dado band and glue in keys, since this construction makes a stronger, smoother and better job. The other lines shown in the diagram are to prove the correctness of the draft. Make C D equal to B C. Draw the arc B N D. Draw A D. Extend C F, cutting A B at E. Draw G H parallel to A B. Then H O is extended to meet A B in the point E. Let A D equal A B. G H equals A E. A H equals C E and C E equals B E.

From P. W., *Branchport, N. Y.*—In recent numbers of *Carpentry and Building* I have noticed that trouble has been experienced by some of the readers in finding the radius of splayed jambs. Fig. 1 represents the plan of a splayed jamb in the wall. Draw B A. Use A C and B C^1 as the radii of inside of arch, and use A D and B D^1 as the radii for the outside of the arch. With the radii B 1 and B X describe the circles or arcs 1 9 and X 2^1, which represent the back of the jamb. Now divide the arc 1 9 into any number of equal parts, as shown in the drawing, and extend B A to O^1, and with the radii A C and A D describe the semicircle C N D^1 and D M O^1. Then D M O^1 will be one-half of the base of a cone with a flare equal to the flare of the jamb. Draw the line O^1 R perpendicular to B O^1, and extend the line P^1 Y to P. Draw A H perpendicular to B O, and continue the lines of the outside and inside of jamb until they intersect A H in the points H and S. Then draw P H and R S, and let fall the perpendicular D^1 L, intersecting R S, as shown in the point L. From H as center, with radii H 1 and H P, strike the arcs 1 9 and P 2^1. Make 1 9 in Fig. 3 equal to 1 9 in Fig. 2. Now from I, the middle point of H 1, draw through 9 in Fig. 3, as shown by I 2^1. Draw the line B A^1 to 4^1. Add 4^1 9, Fig. 2, to the end of the pattern, Fig. 3, to form miter. Extend H A as H O and draw P O perpendicular to H P, intersecting H O as at O. Now through O draw K K^1 parallel to P P^1. Then with O P as radius describe the arcs P K^1 and P^1 K. Then K K^1 is the diameter of the circle of the jamb after bending, the radius being perpendicular to the face of the jamb. Fig. 3 represents the pattern of jamb before bending. The next step is to find the distance between saw cuts on the arc P G, Fig. 3, which is done as follows: Find the circumference of the circle of which K K^1 is the diameter. This can be obtained by simple arithmetical calculation. Taking the diameter, 11 feet 3 inches, as figured on drawing, and multiplying by 3.1416, and reducing, gives 424.116 inches. Supposing the thickness of jamb to be 1½ inches, the diameter of the circle of the inside of jamb will be 3 inches less than that of the outside. Making a similar calculation to that above described, we find that the difference between the circumference of the outside and inside circles in this case is 9.46248 inches. This difference has to be taken out of the length of the larger circle in saw cuts in order to bend the jamb to the required shape. Suppose the saw to cut a kerf $\frac{1}{16}$ inch wide. Then 9.46248 divided by $\frac{1}{16}$, equals 150.7968, will be the number of saw cuts in the whole circumference of the larger circle. Dividing the circumference by the number of saw cuts, we find that they are 2.81 inches apart on the arc P G, Fig. 3. Commencing at P, draw lines representing the direction of cuts to the center H, from which the pattern lines were struck.

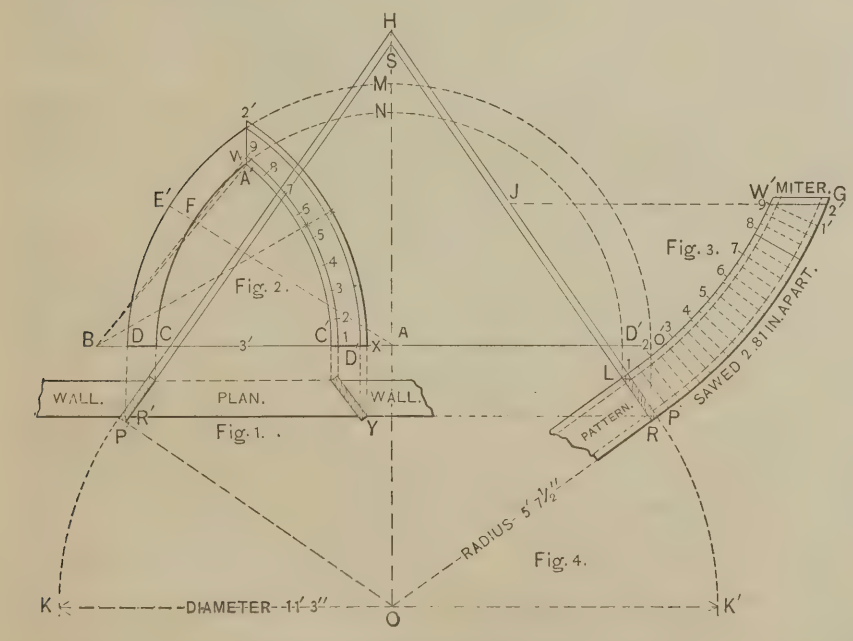
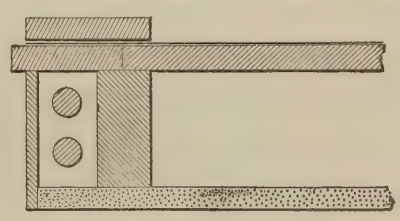


Diagram Accompanying Letter from P. W.

Warm Houses.

From C. J. B., *Minneapolis Minn.*—In reply to "P. F. D., of Fairport, N. Y., I will give a description of a house I built for myself recently, and which has proved to be very easily warmed. The studding was first covered with brown building paper, and then sheathed with matched lumber. This surface was then papered and afterward the siding was put on. Tarred paper was used on the roof under the shingles. In this region we always lay double floors, the under one being of common boards, while the finishing floor is of matched flooring, laid after the house is plastered. In the house in question I laid a course of brown building paper between the floors. These precautions added greatly to the warmth of the house, but one other has perhaps kept out quite as much cold. I refer to the peculiar construction of the window frames, a sketch of which I inclose. From the drawings it will be seen that the blind stop is made wide enough to cover the weight pocket, and to make a joint with the sheeting on the stud, while the paper is made to cover both sheeting and blind stop, and is trimmed off after the outer casing is put on. Accordingly, no cold can get in around the windows. In the house referred to we use no storm sash on the windows. The house is heated with wood stoves located in living-room, parlor and bedroom. These rooms open into each other day and night, and the larder in the kitchen is also left open at night. When the thermometer has indicated 30° to 35° below zero, vegetables have not frozen in the larder, and never has frost entered the house so as to show more than a thin film of ice on water in the lower rooms.



Warm Houses.—Window Construction Described by C. J. B.

Practical Estimating.

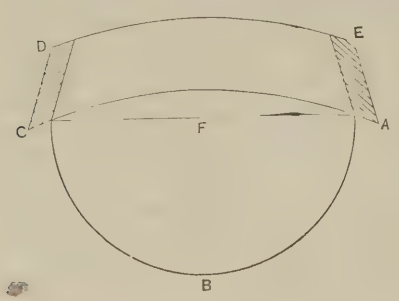
From F. S. C., *Lebanon, Mo.*—Many journeymen in small towns in the West through force of circumstances find themselves so situated that in order to keep up

with the times they are obliged to estimate on work. As they have had no experience in that part of the business, they find it rather uphill work at first. Such, at least, has been my own experience. I could generally do the job better than I could figure on it. I have found it a good plan to figure material a little over than under; consequently, I allow 1000 shingles for 100 feet, superficial, of roof surface. For clapboards I measure the whole surface, doors and windows included, unless they are extra large, and allow one-sixth for waste extra. Cornice inside finish and other parts I estimate in the same general manner, according to circumstances.

REFERRED TO OUR READERS.

Another Problem in Splayed Work.

From J. R. L., *Chillicothe, Mo.*—I have recently encountered another problem in splayed work, differing somewhat from the Gothic jambs which have been recently discussed in the paper. I desire to lay it before the readers for the purpose of solution. I shall be glad to learn of as many ways of finding the shape of the soffit, and also of



Another Problem in Splayed Work, Submitted by J. R. L.

the cuts for bending and fitting into position, as may be. The arcs A C and D E in the accompanying sketch represent the circle of the wall. A F C is the width of the opening. C D and A E represent the splay of the jambs. A B C represent the soffit, which has the same splay as the jambs.

Substitute for Lath and Plaster.

From G. T., *North Solon, Ohio.*—I want something in the place of lath and plaster, and refer the question to the practical readers of *Carpentry and Building*. What is there that can be employed for the purpose? Is there a quality of paper that can be satisfactorily used as a substitute for plaster filling?

Circular Bay Window.

From CHIP, *Cambridge, Ohio.*—I desire to learn, from the practical readers of *Carpentry and Building*, how to get the lines to spring a 12-inch planceer board around on a cornice of a circular bay window. The radius is 9 feet to the point of rafters, and the rafters are half-pitch.

Supporting a Floor.

From J. M. J., *Summit, Miss.*—Several months since, through the correspondence department of *Carpentry and Building* I ask for suggestions as to methods for holding up the second floor of a building 40 x 100 feet. My inquiry was published in the September number for 1883. As I am specially interested in the matter, I beg permission to repeat the request. If the floor cannot be made substantial or the faulty construction cannot be remedied under the circumstances, I raise the question, How should the floor have been constructed in the first place to make it substantial? I do not see why a floor of the kind mentioned cannot be made as substantial in a balloon frame, where 6-inch studding are used, as in any other frame, with same thickness of wall. Several suggestions have been made by builders in this vicinity, some recommending keys in the upper edge of the joists or a laminated arch between the joists. I desire to use some method that has been tried and the reliability of which can be determined beforehand. I think such communications as would answer my questions would be of interest to a considerable number of the readers of *Carpentry and Building*.

Double Dovetailing.

From J. F. W., *New Milford.*—In reading over the instructions for double dovetailing given by "J. S.," of Belleville, in the March number of *Carpentry and Building* for last year, I am somewhat in doubt as to the way the work is done. If he would state how, in dovetailing a box, he would put the last side in, he would confer a favor.

Grout Foundations.

From W. J. R. *Tracy, Minn.*—Have any of the readers of *Carpentry and Building* had experience in using grout for foundations? Is it ever used alone successfully for such buildings as dwellings? If so, does it give satisfaction, and how should it be prepared to use in the wall?

Lathing on Sheeting.

From H. S. B., *Spencer, Iowa.*—I would like to hear from some of the readers of *Carpentry and Building* with reference to lathing on sheeting without furring where a building is sheeted on the inside. Can good work be made in this manner? I should like to know the experience of builders in this regard.

Street Architecture.

From W. H. R., *Benton Harbor, Mich.*—Among the interesting topics discussed in *Carpentry and Building* I trust some one will think it desirable before long to take up the subject of street architecture, particularly two-story brick buildings of moderate cost, suitable for use in villages, and give such designs as will be valuable to the building trade at large. Nothing of this kind hayet appeared, so far as my information goes.

TRADE NOTES.

THE SENECA FALLS MANUFACTURING COMPANY, of Seneca Falls, N. Y., have issued a new catalogue and price list, bearing date 1884 and 1885, which contains a number of new tools, as well as very carefully-prepared descriptions of old devices. Particular attention is devoted to directions for orders by mail. The various tools described are accompanied by a price list of parts, thus facilitating the ordering of repairs. The company also furnish scroll-sawing designs, an illustrated circular and price list of which they will send by mail to any applicant.

THE EGAN COMPANY, of Cincinnati, have forwarded for our inspection a testimonial they have recently received from the Estey Manufacturing Company, Owosso, Mich., makers of fine furniture, with reference to the sand-papering machine which they purchased some time since of the Egan Company, and an illustration of which appeared in our columns some months ago. The Estey Manufacturing Company say in substance that they give this machine the preference over all others that they have tried, and that it is the eighth one they have purchased. We understand from the Egan Company that 13 of these machines are now running in Philadelphia alone.

IN THE PAST no carpenter's assortment of tools has been considered complete without a ratchet brace, by which holes may be bored in corners and other positions where a complete revolution of the brace is impossible. For the future builders will have the choice between purchasing such a tool and buying one of Amidon's corner braces, illustrations of which we presented in our department of "Novelties" in August, 1884. This brace does all that a ratchet brace will do, in a very satisfactory manner. The manufacturers, Messrs. Amidon & White, No. 135 Main street, Buffalo, N. Y., have recently issued a circular enumerating the advantages which it possesses and which entitle it to consideration.

WE HAVE RECEIVED from Benedict & Davis, Bangor, Pen Argyle, Pa., a neat little pamphlet describing Bangor black roofing slate, of which they are manufacturers in North Hampton County, Pa. The company have a branch office at Old Pier 41, North River, New York City. The claims of slate as a roofing material, with considerations of cost, durability, fire-proof qualities, &c., are presented. A number of illustrations are presented, including cuts of slaters' tools, all of which are of interest to roofers and builders as well.

THE CAMBRIDGE ROOFING COMPANY, of Cambridge, Ohio, have their iron roofing and siding exhibited at the World's Industrial and Cotton Centennial Exposition, New Orleans, upon a building 100 x 40 feet. We understand that a stock of siding is also to be kept in New Orleans for sale.

STRAY CHIPS.

H. E. SANFORD is building a magnificent residence at Narragansett Pier, R. I., from plans prepared by Architect J. M. Merrick, of New York. The house will cost $20,000.

THE SAN MATEO Library Association, of San Mateo, Cal., are erecting a two-story brick structure from designs executed by Messrs. Percy & Hamilton; cost, $10,500.

E. R. UPHAM has charge of a factory building, 225 x 150 feet in plan, now in progress of erection at Mobile, Ala., for Messrs. Lombard, Ayres & Co., of New York. The machinery will be run by an engine of 60 horse-power.

AMONG the new buildings in course of erection in Dowagiac, Wis., we notice a dwelling-house for Frank Lyle, from plans by D. S. Hopkins; cost, $5000. One for Mrs. S. A. Andrew, by Mark Judd, from plans by J. E. Andrew; cost, $2500; and a new skating rink for Fowle & Guthall, 120 x 50 feet in plan, by B. R. Soules; cost, $3500.

THE CONTRACT for joiner-work and woodwork on the custom house and post office at Jackson, Miss., has been awarded to the Robert Mitchell Furniture Company, of Cincinnati, Ohio, at their bid, $11,320 for white pine and white oak.

MESSRS. JOSEPH HIGH & CO., of Pottstown, Pa., are making some improvements in the way of new buildings, which will be completed early in the year. They are erecting a foundry building, 30 x 32 feet in size, and a machine shop, 18 x 26 feet in plan, two stories in hight.

A COURT HOUSE is contemplated at Canton, Dak. that will involve an expenditure of $40,000.

LOUIS ERTEL, of Cincinnati, is putting up a two-story brick structure, with 20 feet front, on the northeast corner of Montgomery, Pike and Hewitt streets; cost, $3000. Several other enterprises are projected, involving, however, a comparatively small outlay of capital.

CHARLES A. JAMES, the cashier of the Bank of Washington, is erecting a residence for himself on the south side of Massachusetts avenue, between Thirteenth and Fourteenth streets, Washington, D. C. It has a frontage of 22 feet 6 inches and a depth of 68 feet. The house will be three stories high, with an attic story and basement. The front will be of pressed brick, with Hummelstown stone trimmings, and one of the features will be a picturesque loggia on the third story. The gable which surmounts the house will be of pressed brick and handsomely carved. The interior will be finished in good style, and on the first floor hardwood will be used. An oak screen shuts off the library from the hall. All the rooms and halls on the first floor have sliding doors, so that the entire first floor can be thrown into one room. Messrs. Gray & Page are the architects. The cost will be about $12,000.

THE CONTRACT has recently been let by Messrs. P. C. Flocter & Co. for erecting and completing a new church for Trinity Parish, in Bay City, Mich. It will be constructed of Sandusky limestone, trimmed with Berea sandstone, in the Gothic style of architecture, and will cost, completed, $40,000.

AUGUST RIESNER, of St. Paul, Minn., is erecting a two-story frame store and dwelling on West Seventh street, between Lee avenue and Seventh street; cost, $3000. Also, Wm. Faulke is constructing a two-story frame dwelling, 27 x 43 feet on the ground, on Lincoln avenue, between Oakland and Dale streets; cost, $3500.

AMONG THE new buildings in progress of erection in East Hartford, Conn., is a dwelling on Wells avenue for H. G. Beaumont, and a double tenement house on Woodbridge avenue for Joel C. Tafft.

BEVIL & CO., of Greensboro, N. C., have a building, 60 x 150 feet in plan, in progress of erection, which they will use as a tobacco factory. We have not been informed as to the cost of the structure.

THE DRAWINGS for two three-story structures, each 18 x 50 feet in size, to be erected on Laurens street, near Park avenue, have been prepared by Frank E. Davis, Baltimore, Md. The buildings will be of brick, with Cheat River and marble trimmings, and will cost $11,000. James Thompson is the owner and Jackson Holland the builder.

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A MONTHLY JOURNAL.

VOLUME VII. NEW YORK=FEBRUARY, 1885. NUMBER 2

Sheet-Metal Statuary.

A conspicuous feature in the finish and decoration of the main building erected for the New Orleans Exhibition, now in progress, is the group of sheet-metal statuary which has been placed over the principal entrance, a view of which is afforded by the accompanying engraving. The work is a reproduction of one of the four groups which embellish the corners of the inclosure surrounding the famous Albert Memorial, in Hyde Park, London. It is called America, the other three being Europe, Asia and Africa. It has also been described as "The United States Directing the Onward Course of America," and was deemed by the architect and managers of the exhibition an appropriate subject for the very conspicuous position that has been given it. We shall not attempt to describe the group as a work of art, nor yet to present an explanation of its allegorical significance, for our readers are less interested in these features than in the material in which the work has been done. The wild buffalo, the Indian and other features are sufficiently prominent in the composition to enable every one to form some conception of the idea which was in the mind of the designer of the original group. A model of it was shown at the Centennial Exhibition, and it has been widely published in the art journals and variously commented upon.

The group shown in our engraving was executed in sheet zinc by Messrs. Bakewell & Mullins, of Salem, Ohio. Both die work and *repoussé* work were employed in its production, and the result, while in no way a work of art in the sense of the original, is among the best of its kind that has yet been produced in this country. Sheet metal has several important advantages which fit it in a peculiar manner for employment in the production of decorative work in cases where money is limited and where time in which to do the work is too short to permit of elaborate preparations. It is readily molded into almost any desired shape, with very little preliminary outlay in the way of tools or appliances, and the work in the hands of competent artisans is rapidly performed. The weight of the finished parts is far less than would be that of similar work executed in any other material, not excepting wood. Accordingly, sheet-metal work of this character has in its favor, among other advantages, rapidity of production, low cost and lightness, the latter rendering it unnecessary to provide special strength in that part of a structure which is to be surmounted by a piece of sheet-metal statuary.

With reference to the artistic excellence of work of this kind, using the term in the sense of correctness of form, general finish and character, it may be remarked that this can be carried up to any desired degree, depending only upon the ability of those who execute the work and the pains taken. We have in our sanctum as we write one or two pieces of sheet-metal work that are veritable art treasures, and yet we have seen work in the past, of the same general class, that was a burlesque on art. Because sheet-metal work is not always well done nor always artistic, it is not to be argued that it is impossible to do good work in sheet metal. From the fact that sheet-metal work is cheap, and that for the most part it is an imitation of work in more costly material, purchasers are often disposed to buy it, if possible, below its actual valuation. This leads manufacturers to attempt to produce it at still lower cost, to the general

ALLEGORICAL GROUP IN SHEET METAL, ON THE MAIN BUILDING, NEW ORLEANS EXHIBITION.

"The United States Directing the Onward Course of America."

degradation of the work. We feel safe in asserting that sheet-metal work, including statues of Commerce, Justice, Agriculture, &c., so frequently required by builders, and also allegorical groups representing various ideas, can in the present state of the art be obtained of most excellent quality, provided a fair price is conceded. This need not be a figure that will bring the cost of sheet metal up to that of better materials, but a sum will be sufficient for the purpose that will leave a wide margin of advantage on the side of sheet metal. We are led to these remarks by letters of inquiry and comment which have recently reached us upon this general subject. The group shown in the engraving stands some 70 feet from the ground, being just above the main cornice of the building. It presents a fine appearance, and will not fail to be observed by the majority of visitors who are in the least inclined to examine details of construction and decoration.

A Cheap Cottage.

In the accompanying illustrations Mr. William H. Penn, 188 London street, Lowell, Mass., has presented a design in which economy, convenience and appearance have been carefully considered. The roof is simple in construction, and yet is broken in a way to enhance the general effect. From the designer's specification we gain that the foundations are to be of either rubble stone or hard-burnt brick, that the first story is to be provided with a double floor, and the second story with a single floor, laid of matched stuff. The chamber in the second story at the left is to be provided with a thimble, entering the chimney above the door hight. The cellar is intended to be dug 4 feet below the general surface of the building, the ground to be graded so as to leave 2 feet of wall exposed. The cost of this building, with the present low price of labor and materials, is estimated by the author at about $800.

A CHEAP COTTAGE.—DESIGNED BY WILLIAM H. PENN, LOWELL, MASS.

An article on sawed rosettes, contributed by Mr. Rathbun, of Wheeling, W. Va., and published in one of our issues for the fall of 1884, has been deemed of sufficient interest and value to be reproduced by some of our English exchanges. No credit, however, appears to either the author or to the journal from which the account was taken. One paper presents it in a form as though it were entirely new, and speaks almost patronizingly of the "numerous samples of rosettes kindly sent." We mention this matter simply as being of interest both to the author of the device and to our readers generally.

NOTES AND COMMENTS.

In another column in this issue is presented an illustrated description of one method of laying copper roofs. The plan outlined cannot be considered peculiar to copper, for, in its essential features, it is very similar to methods which have been used for many years past both in England and on the Continent for laying zinc roofs. The requirements in point of construction for roofs of copper and zinc are not unlike. The great difficulty is to make sufficient provision for contraction and expansion. In the plan described in this issue this is secured by extending the sheet metal up the sides of a wooden strip and fastening it in place by cleats, and covering in the strip by a cap which is double-seamed to the edges of the two adjacent sheets of metal. The plan of construction, while not new, will no doubt be novel to many of our readers. It is worthy of consideration. There are various other plans for managing copper and zinc roofs, some of which we expect to publish.

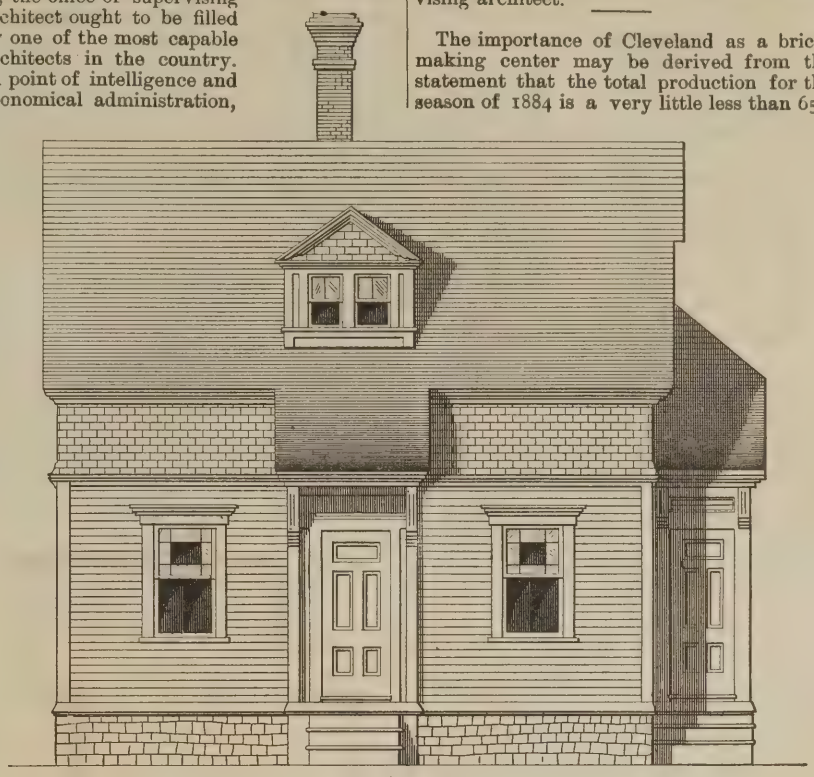
Our readers will remember the presentation in our columns, a short time since, of a number of slate and shingle patterns, particularly the latter. Some of these were cut in very intricate patterns, and at first glance would seem to be of a character to involve considerable expense. In passing through the machine shops of E. W. Bliss, the well-known machine builder of Brooklyn, a short time since, we had the opportunity of examining how at least one manufacturer is avoiding a large share of the expense involved in patterns of this kind. His method is to cut the shingles under a powerful press, by means of dies, in the same general manner as plates of metal are commonly cut for use in tinware and for other purposes. No less than 10 presses, with as many sets of dies, making altogether 10 patterns without any combinations, were being fitted up in this manner for the purpose named. This suggestion may be serviceable to planing mills and others having a large amount of work to do. There does not seem to be the necessity in ordinary cases of more than one or two presses. The dies are portable, and may be used in any press at will. The expense of a pair of dies adapted for cutting a shingle pattern is not so heavy an item but that the saving on a single job would probably be more than enough to pay for them. The press required in such work is of a very common variety, and could be employed for various other purposes.

We have already mentioned in these columns that our regular St. Louis correspondent, Mr. Charles E. Illsley, has been honored by being made the first president of the Western Association of Architects. He was the unanimous choice of the convention recently held in Chicago. The *Inland Architect and Builder*, in a recent issue, gives the following particulars concerning this gentleman's life and work: "Mr. Illsley is, besides his high rank in the profession, peculiarly fitted to represent the architects of the West, his education being of a practical as well as theoretical nature, giving him a peculiar advantage in the performance of those duties which come within the province of his office. Biographically speaking, his father, Mr. Edward Illsley, was born at Portland, Me., and pursued the business of a building carpenter in Boston, New York City, Newark, N. J., Chicago, Ill., and St. Louis, Mo. He moved to Chicago in 1853, where he was identified with church and residence work, the building of the Cook County Hospital, &c., for Carter & Bauer and other architects. Afterward he resided for a time at Batavia, and from thence moved to St. Louis in 1869, where he has continued the business of a building contractor to this date, his name being mentioned as the contractor for the framing and floors in the St. Louis Exposition building. Mr. C. E. Illsley was born in New York City, May 29, 1842, and graduated at St. Louis High School in 1860. Following this a college course was pursued at Washington University, St. Louis, from which he graduated as A. B. in 1864, with the honor of the salutatory in Latin. After an architectural and engineering course of study, Mr. Illsley graduated at the Rensselear Polytechnic Institute, at Troy, N. Y., in 1867, with degree of C. E., returning to St.

Louis the same year to accept a position in the Washington University as instructor in mathematics, descriptive geometry and civil engineering, resigning after a year and a half to take a position as assistant city engineer in the street department of St. Louis city government. In 1872 Mr. Illsley began business for himself as architect, continuing in this to the present time. As an architect Mr. Illsley, though a comparatively young man, ranks well in his profession."

What is termed "built-up wood" is fabricated in the following manner: Several thin sheets of wood—they are called veneers, though they are sometimes an ⅛ inch thick—are glued one upon another, with the grain of each sheet crossing the grain of the sheet next above or below it at right angles; and, when the whole complex fabric has lost all power of resistance, through being almost saturated with steaming glue, it is pressed into an almost homogeneous board without any cleavage whatever, and so without possibility of splitting. Every sort of wood, of course, can be built up. The inside layers can be cheap and the outside choice. No matter whether or not the different sheets naturally swell and shrink evenly together, they are too thin to exert much force. Their separate identities are lost in the common union. The advantages of economy, strength in every direction, and immunity from cracking are enough to give the fabric the readiest possible acceptance for whatever uses it may be adopted. It is in use for broad, flat surfaces in cabinet-work, especially where strength or permanence is wanted. It already competes with canvas for the use of artists, and with binders' board for book-covers. Its availability for any purpose appears to be a question of expense and skill—never of quality.

The position of the Government supervising architect in this country is in some sense a peculiar one. His pay is comparatively small, and his position is that of a mere clerk in the Treasury Department, removable at the pleasure of the Secretary The position, all things considered, is so indefinite and so precarious as to tempt no architect who has real ability and who is able to build up a successful business of his own. It is owing to these facts, which indicate short-sighted management upon the part of our Government, that many scandals in connection with our public work have arisen. Incompetent and dishonest men have before now occupied the position, to the shame and disgrace of the nation. The recent decision that plans for public buildings must be capable of being executed for the appropriation made by Congress has been in part brought about by the unsatisfactory state of affairs in the office of the supervising architect. The real trouble, no doubt, is that appropriations made by the Government are very generally regulated by local importunity, instead of by a consideration of the needs of the Government which ought to control them. However it may be looked at, the office of supervising architect ought to be filled by one of the most capable architects in the country. In point of intelligence and economical administration,

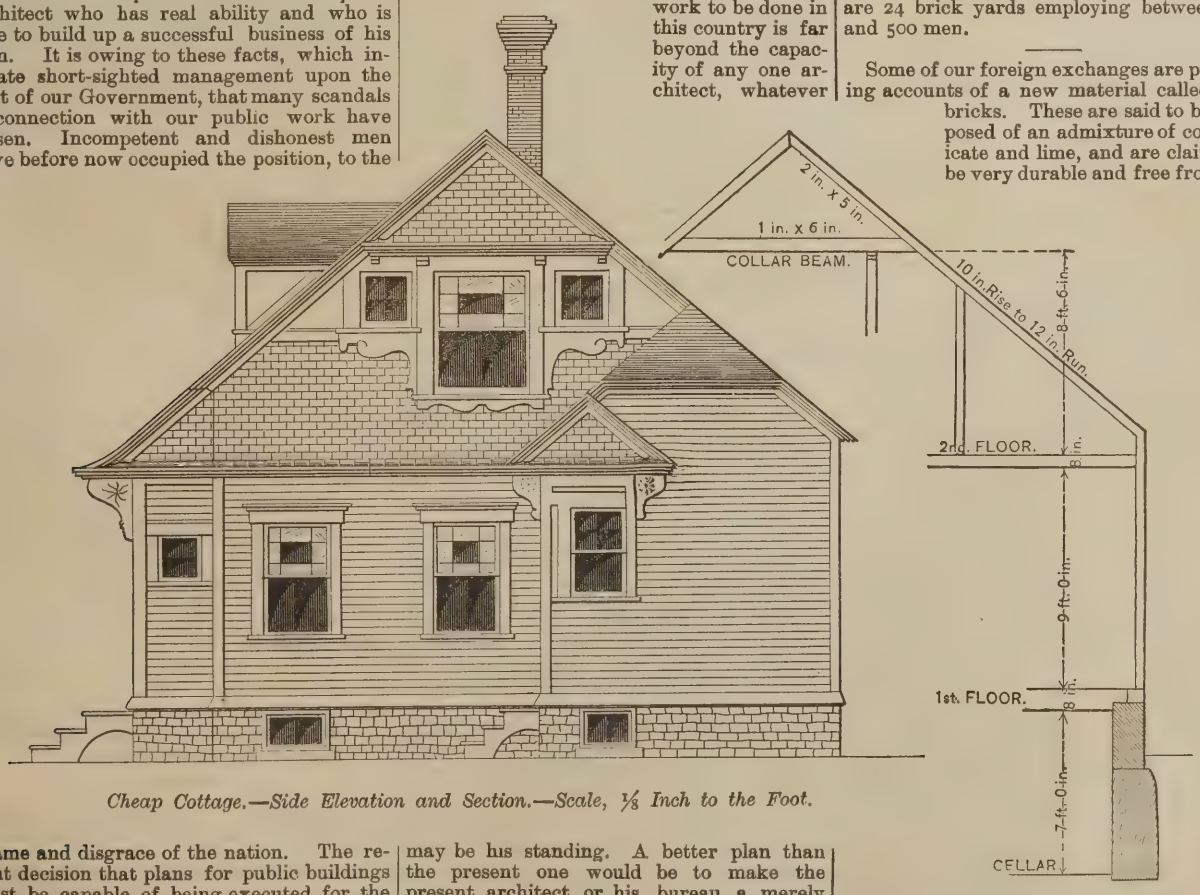


Cheap Cottage.—Front Elevation.—Scale, ⅛ Inch to the Foot.

not to speak of architectural art, the public buildings of France, where the position of Government architect is a professional prize, are much better than either in England or in this country, where the planning, design and construction of public buildings are in effect left to chance. The work to be done in this country is far beyond the capacity of any one architect, whatever may be his standing. A better plan than the present one would be to make the present architect or his bureau a merely supervising office, with some system of assigning the designs of public buildings to competent local architects. Under these conditions the work would no doubt be much better done than at present. In that case appropriations for public buildings would be made not according to local ambitions, but according to estimates made impartially in the annual report of the supervising architect.

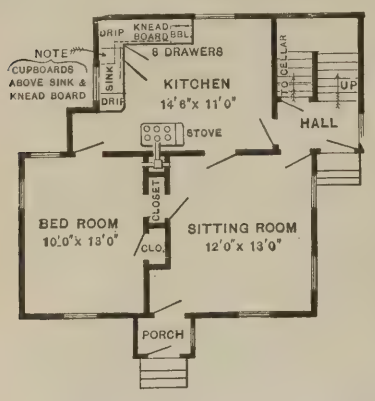
The importance of Cleveland as a brick-making center may be derived from the statement that the total production for the season of 1884 is a very little less than 65,000,000, being about 500,000 more than were made during 1883. The sales during last year were less than during the preceding year, and an average surplus of about 20 per cent., it is estimated, is being carried over. The prices during last season were lower, ranging about $1 per 1000 under the figures of 1883. There are 24 brick yards employing between 400 and 500 men.

Some of our foreign exchanges are publishing accounts of a new material called cork bricks. These are said to be composed of an admixture of cork, silicate and lime, and are claimed to be very durable and free from any tendency to rot. Brick of this kind have the advantage of being non-conductors, and therefore resisting both heat and cold. They are light in weight, and are easily



Cheap Cottage.—Side Elevation and Section.—Scale, ⅛ Inch to the Foot.

handled. An advantage claimed for this material is that with it an interior wall may be built where a wall of ordinary brick would be too heavy. On the other hand, the wall of the new material will be equally durable and substantial to that of ordinary brick. The

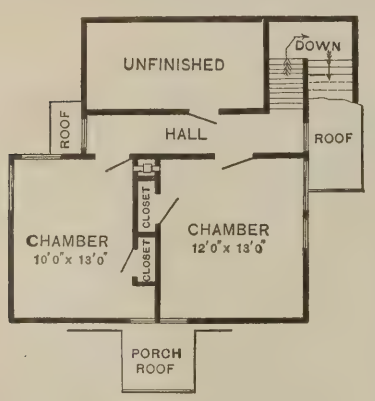


Cheap Cottage.—First Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

new material, it is said, may be nailed to laths as a covering for roofs, or for ceilings or for wall linings. It is also said to be a good damp preventor.

Copyright Property.

The Long Island *Journal*, some time since, published the history of a copyright contest, which is very interesting to manufacturers



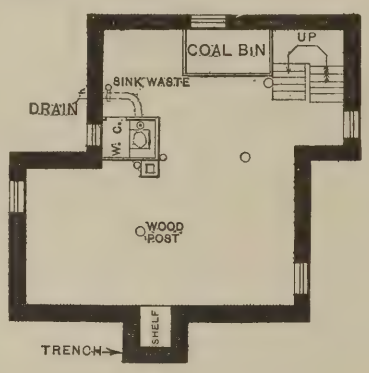
Second Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

who issue expensive catalogues containing original designs:

After several years' arduous labor the late J. Milnor Peck got into thorough working shape his elaborate plans for building patent portable houses, and successfully started large contracts for the South American trade. At an expense of several thousand dollars he prepared an illustrated catalogue of plans of this class of buildings, including detail drawings, &c., the letter-press of the work being printed in Spanish and English. The work was duly copyrighted at Washington, and several thousand copies sent to all parts of the world. Recently a second edition of the book was published, at a large expense, to meet the great demand for it, and meantime the business of the Flushing Lumber and Building Company assumed large proportions through the judicious work that had been done. In fact, it may be said that all the preliminary work in bringing this style of building before the public had been completed, and the company, having an article for which there was a great demand, had a right to expect liberal returns from their enterprise, and to be protected in their business. It may readily be understood, then, how provoked the Flushing Company were when they ascertained that the Pitch Pine Manufacturers' Association, Limited, of New York, had issued a duplicate of their valuable work. Their publication was a *fac simile* in every respect of the Flushing Company's work. The size of the book, the plates, the reading matter in Spanish and English, even to the style of the type, all were nearly identical, and a circular accompanying the book offered to build the Peck portable house cheaper than they could be built anywhere, even than by the Flushing Company, the original patentees of the plan.

Section of Belt.—Scale, 1 Inch to the Foot.

Mr. Isaac Peck, who is now managing the the business of the Flushing Lumber and Building Company, and acting agent of the Milnor Peck estate, procured a copy of the "Pitch Pine" book and laid the facts before distinguished counsel in New York. A case was at once made up before the Supreme Court and an injunction was served on the infringers. The facts as related all came out upon the examination, and, the copyright being proved, the Pitch Pine Association were ordered to deliver to Mr. Peck all the



Foundation Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

books they had printed, and to have returned and also delivered to Mr. Peck all the books which had been sent out by them to customers. They were also required to pay all the expenses in the suit. The injunction against the Pitch Pine Association has been made perpetual, and the association have made affidavit that all the catalogues on hand have been returned, and that all other conditions ordered by the court have been complied with.

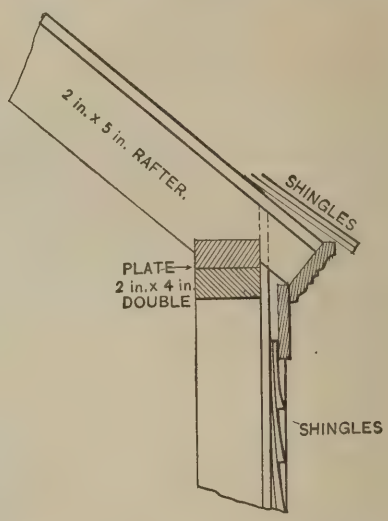
NEW PUBLICATIONS.

STAIR-BUILDING MADE EASY Being a full and clear description of the art of building the bodies, carriages and cases for all kinds of stairs and steps, together with illustrations, &c., to which is added an illustrated glossary of terms, &c. By Fred. T. Hodgson; 123 pages, 5 x 7½ inches, 123 illustrations, bound in cloth. Published by the Industrial Publication Company. Price, $1.

This is the latest addition to the series of cheap technical and practical volumes in the preparation of which Mr. Hodgson has been for some time engaged. The present work differs from most of the stair-building books which have preceded it in the fact that the purely theoretical has been kept in the background, and the practical has been given the first place. The problems in hand-railing receive very little attention, while methods of timbering stairs are very carefully considered. The author has attempted to first teach the young workmen how to build a stair of the humblest sort, and then lead him step by step to the consideration of the most complex construction required in modern buildings. The reader at the outset is presumed to know nothing of stair-building, and therefore it is fair to expect that his simplest questions will be answered. The work is profusely illustrated, the author having borrowed examples from various English and American works, and completed the assortment by illustrations from current periodicals and manufacturers' catalogues.

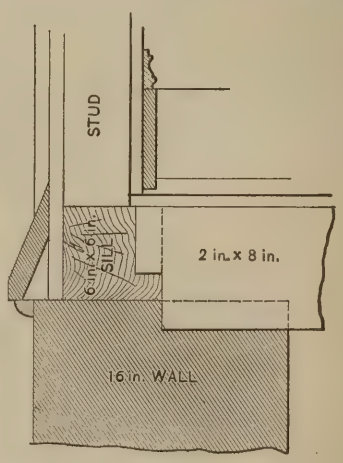
THE ART AND SCIENCE OF STAIR-BUILDING. By the author of "Carpenters' and Builders' Arts," "American Stair-builders' Guide," &c. Size, 5 x 6½ inches, bound in cloth, 36 engraved plates. Published by William T. Comstock. Price $1.

The above is the title and description of the new work just out by L. D. Gould, whose previous volumes on the subject of stair-building have had a wide circulation. In the preface the author states that it has been his object in the present work to reduce the art



Section Through Cornice.—Scale, 1 Inch to the Foot.

and science of stair-building to the shortest and most simple system of lines which will reach the end desired. The work is commenced by a description of the method of producing an elliptical curve with thread or cord in pencil. Following are problems in hand-railing, varying in character from those which may be described as simple to those that are quite complex. The plates are on the left-hand pages, while very brief text is on the right-hand pages facing them. It is to be feared, in glancing through this work, that the author has omitted many particulars and explanations which would have been appreciated by the average student, and that in his attempt to reduce the art and science of stair-building to brief compass he has made it so short that some will fail to comprehend him. The book is one of the most

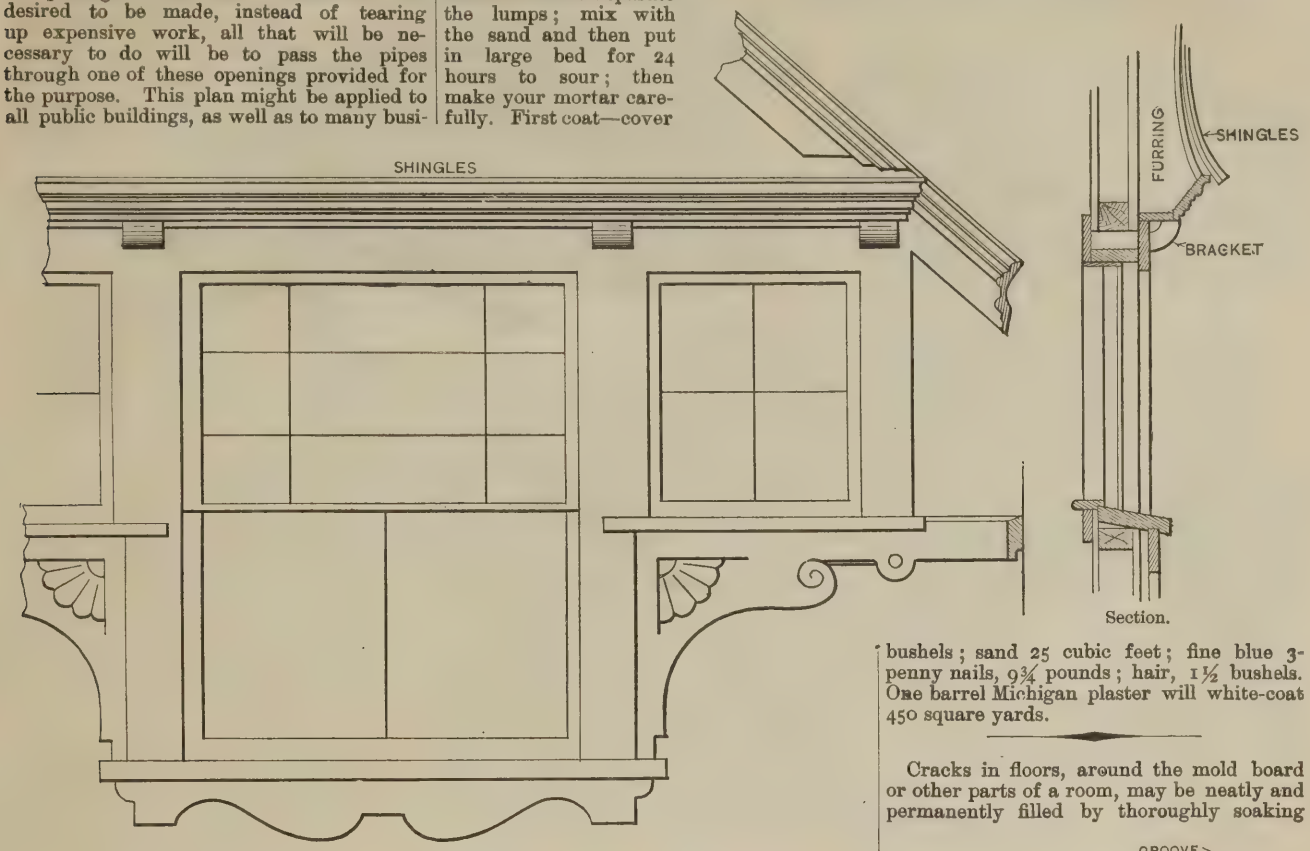


Section Through Water Table.—Scale, 1 Inch to the Foot.

compact, considering the amount of ground covered, that is now before the public relating to the subject of hand-railing.

The annoyance and loss from broken pavements in front of new buildings, caused by introducing water, gas and steam pipes, as commonly performed, is something that is very desirable to avoid. A plan has been suggested for use in connection with the new City Hall, in Philadelphia, that commends itself for adoption to all managers of public buildings. The plan is very simple and con-

sists merely in providing at the time the building is erected conduits or ducts into the building at each of its corners, and a sub-way around the building under the paving. When new connections are desired to be made, instead of tearing up expensive work, all that will be necessary to do will be to pass the pipes through one of these openings provided for the purpose. This plan might be applied to all public buildings, as well as to many business blocks and to private residences. It is not a new idea, but it has never been brought into general use. A general adoption of the plan would furnish an effective protection against perpetual tearing up for water, gas, sewer and wire connections. These last are likely to become very frequent after wires have been buried according to the new law.



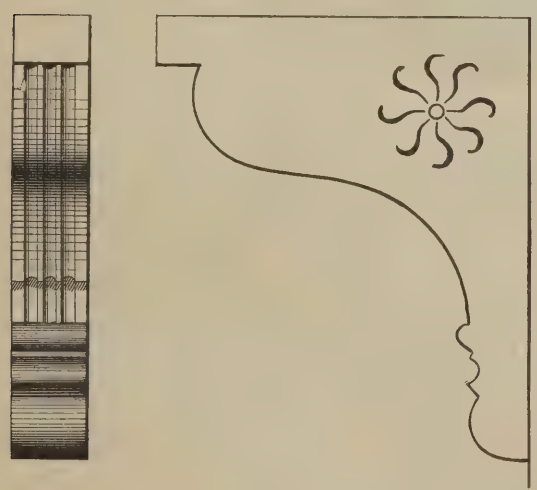
Section.

Cheap Cottage.—Elevation Second Story Window.—Scale, ½ Inch to the Foot.

Plastering.

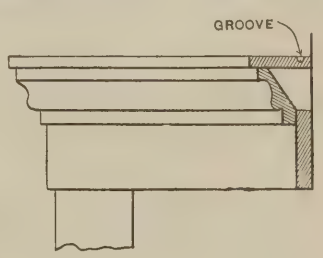
A practical plasterer of Cincinnati recently contributed to the *Building Review* directions for doing a first-class job of plastering, a job which, it is declared, will last well, look well and reflect credit upon the man who does the work. The following are the directions as published:

Pine or poplar lath should be used, with ⅜-inch joints, well nailed. In making the mortar, sharp sand, medium coarse, run through a No. 3½ screen, should be used, with well-burnt Springfield lime, run through a No. 8 sand sieve, to separate the core from the liquid as run into the sand. Use long winter cattle hair, 1 bushel to 1000 laths; soak it well to separate the lumps; mix with the sand and then put in large bed for 24 hours to sour; then make your mortar carefully. First coat—cover the laths well and press up so as to give a good key when dry. Second coat—mortar need not be so rich nor contain so much hair. Straighten walls with a straight-edge, then water-float. When bone-dry, white-skim. Lay first coat on with float, second coat with trowel; cover well and lay on straight; trowel off with brush and water; on walls finish top and bottom to avoid black joinings; brush well to avoid gloss of trowel. In winter the safest way is to lay on both coats of mortar immediately, one after the other, and draw them up well, which prevents them from separating and falling off if caught by frost; otherwise the first coat becomes frozen and the second is liable to be jarred off. Sand-finish for paint is composed of washed sand and lime, the latter run through a No. 16 sieve. Lay on at two coats and float down thoroughly with water and trowel, removing all the "fat." For frescoing or oil painting, lay on two coats with float straight; float it up fine; go over it twice, leaving no slobbers on the work. Around the frames and around the base use a straight-edge, so that the finish will fit nicely to the wall. Brick walls should be built plumb and to a line, outside and inside, so that the same thickness of mortar can be used all over, and thus prevent cracking. The same remark applies to ceilings and stud partitions. The joists and studding should be dressed to a uniform width and bridged every 4 feet to stiffen floors and partitions. Where studs come up to brick walls, the walls should be plugged and studs spiked to walls, which will prevent cracking of the plastering. People often wonder why the plastering cracks, and either do not know or do not consider that the house has poor foundations, or that green lumber was used in its construction, either of which is certain to spoil the plastering, especially when there is a furnace in the house and the mercury up to 90°. These are the proper proportions of materials for 100 square yards good plastering on lath walls: Laths, 1500; lime, 10 bushels; sand 25 cubic feet; fine blue 3-penny nails, 9¾ pounds; hair, 1½ bushels. One barrel Michigan plaster will white-coat 450 square yards.

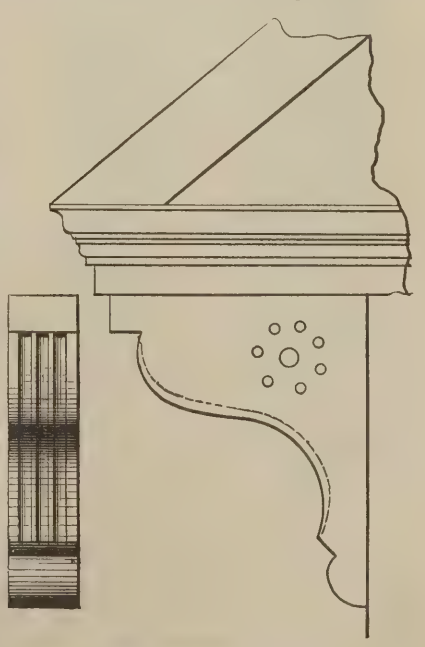


Bracket on Front Porch.—Scale, 1 Inch to the Foot.

Cracks in floors, around the mold board or other parts of a room, may be neatly and permanently filled by thoroughly soaking newspapers in paste made of 1 pound of flour, 3 quarts of water and a teaspoonful of alum, thoroughly boiled and mixed. The mixture will be about as thick as putty and may be forced into the cracks with a case knife. It will harden like *papier maché*.



Window Cap.—Scale, 1 Inch to the Foot.

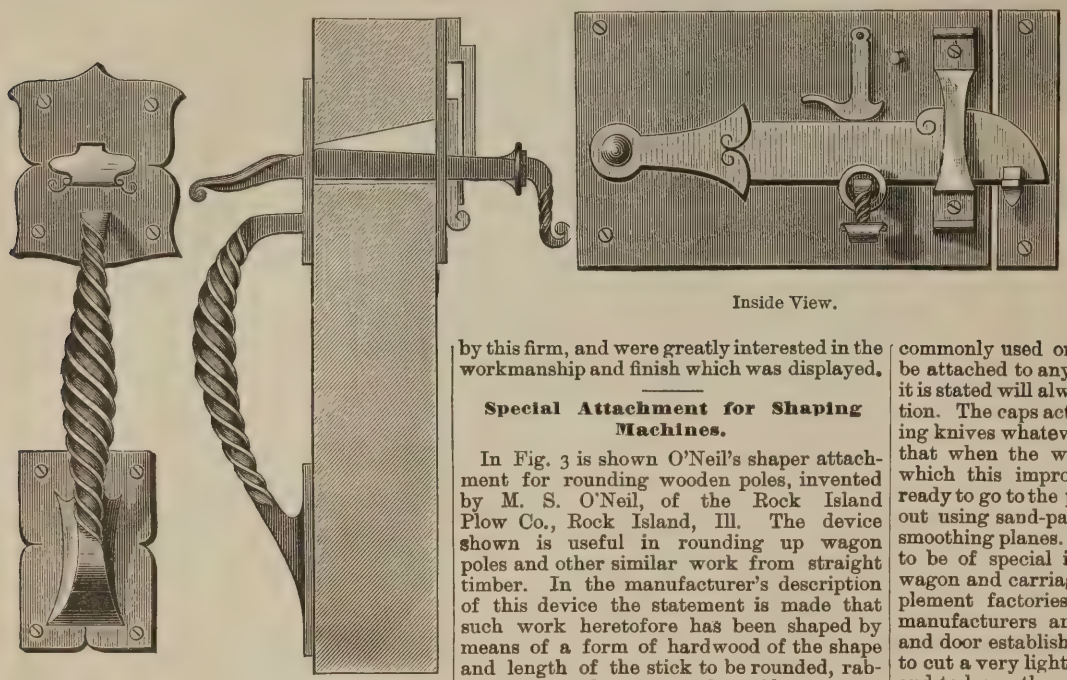


Side Porch.—Scale, 1 Inch to the Foot.

NOVELTIES.

Modern Brasswork.

In the furnishing of modern buildings, whether they be for residences, business or banks, express offices, &c. There is almost an infinite variety of styles that may be produced in goods of this class, and additions to patterns are being constantly made. We recently inspected some of the work produced by this firm, and were greatly interested in the workmanship and finish which was displayed.



Novelties.—Fig. 1.—Polished Brass Thumb-Latch.—One-third Size.

other purposes, there is a growing demand for what is commonly designated as art metal-work. To a certain extent this demand is supplied by the bronze goods sold by hardware dealers generally, but in many cases special designs of wrought brasswork are demanded. Messrs. J. B. Shannon & Sons, No. 1020 Market street, Philadelphia, who are already well known to our readers, have for some time past been making a specialty of the latter class of goods. Figs. 1 and 2 of our illustrations show articles of the kind we refer to. Some of the patterns which this firm produce are in the nature of stock work and are carried on hand, while others are made to order from architects' designs, &c. The first of the illustrations referred to shows a thumb-latch of an old conventional pattern, which was in very common use one or two generations ago, but which at present, in its original form, is seldom seen. In the present case the latch is made of wrought brass and is finished by polishing. The handle, it will be seen, is twisted, while the latch, thumb-piece and other parts are wrought in a way to be at once attractive to the eye and effective in the positions in which they are placed. Our second engraving shows a polished brass railing, such as is very frequently employed in business offices,

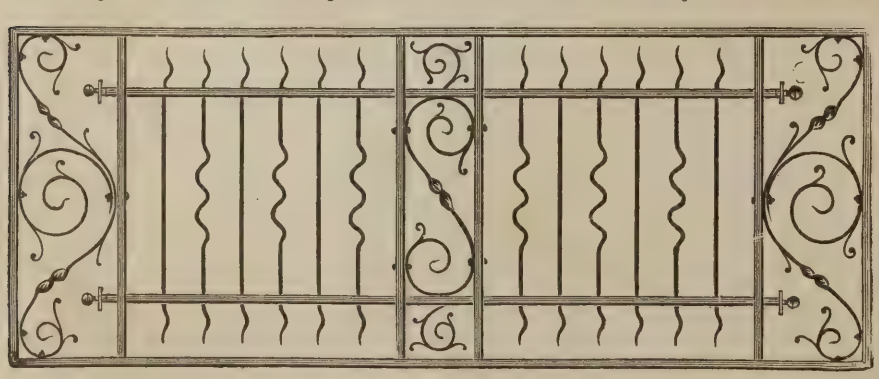


Fig. 2.—Polished Brass Railing.

Special Attachment for Shaping Machines.

In Fig. 3 is shown O'Neil's shaper attachment for rounding wooden poles, invented by M. S. O'Neil, of the Rock Island Plow Co., Rock Island, Ill. The device shown is useful in rounding up wagon poles and other similar work from straight timber. In the manufacturer's description of this device the statement is made that such work heretofore has been shaped by means of a form of hardwood of the shape and length of the stick to be rounded, rabbeted out on the upper and outside corner of the form as far as desired to round the pole. This method makes necessary the services of two operatives. The object of the present device is to abolish the hardwood form altogether and to replace it by an attachment to the shaper which requires but one operative. One advantage to which the inventor directs attention is that the tongues can be made uniformly oval or round at the sides, and that they are free from the objection of warping. The device may be described as a pole-shaving machine, having adjustable gauges on the side of the bed toward the cutter-head, with spring arms on the side of the bed opposite the cutter-head to hold the work against the gauges and cutter-heads, and having rollers, as shown in the engraving, borne on adjustable arms to press the timber against the bed-plate. The bed-plate is a metal casting or thin slab of hardwood which is bolted to the table of an ordinary shaper. The knives used on this machine are furnished with what are known as O'Neil's patent smoothing caps, one of which is illustrated in Fig. 4. This engraving shows a cap attached to a rounded bit such as is commonly used on shapers. These caps can be attached to any shaped bits whatever, and it is stated will always perform the same function. The caps act as smoothing bits for planing knives whatever their shape. It is stated that when the work leaves the machine in which this improvement is embodied it is ready to go to the paint or varnish shop without using sand-paper or sand belts or hand smoothing planes. These improvements seem to be of special interest to plow factories, wagon and carriage works, agricultural implement factories, as well as to furniture manufacturers and managers of sash, blind and door establishments. The bits are said to cut a very light shaving when set to do so, and to leave the surface smooth.

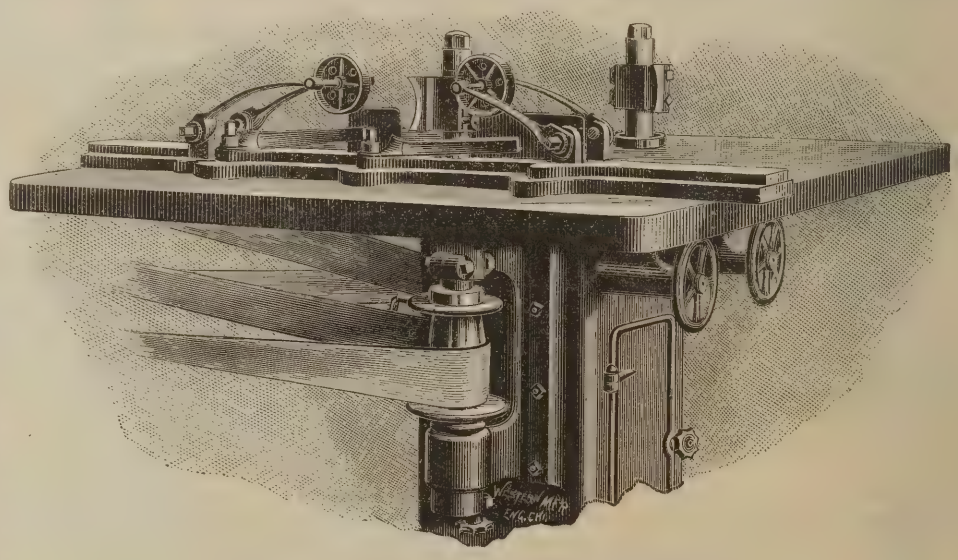
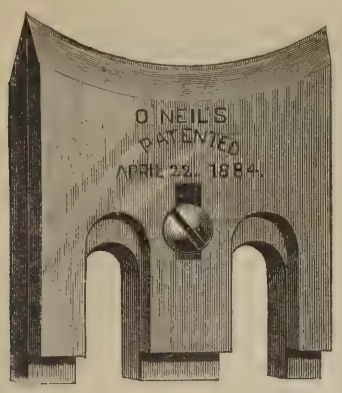


Fig. 3.—Special Attachment for Shaping Machines.

Judson's Automatic Fire-Alarm.

An automatic fire-alarm of simple construction, known as Judson's automatic fire-alarm, has recently been brought out, the essential feature of which is a wire soldered together at frequent intervals by a very fusible alloy, the melting of which parts the wire and sets off the alarm. The alarm consists of a clock mechanism mounted in a suitalbe manner on a board 4 x 6 inches in size. From this alarm a wire ascends to the ceiling and thence passes over pulleys through the various rooms, closets and apartments in which a fire is liable to occur. The clockwork is kept from unwinding by a click, to which a lever-arm is attached extending beyond the casing; to the end of this lever, at the side of the alarm, is fastenen a spiral spring, which, when distended, holds the lever in place. The spring is kept in a state of tension by the wire, which passes through the building and is securely fastened at its further end. Highly fusible connections, already mentioned, placed about 10 feet apart, unite the different sections of the wire. When the temperature of a room through which the wire passes rises to about 130° F., the connector melts and parts the wire, the spring contracts, raises the click and sets free the alarm mechanism, by which a bell is rung violently for some minutes. It

is not necessary that the flame come in contact with the connections, since, melting at so low a temperature, the heat, in case of fire, would be sufficient to set off the alarm, though as an extra precaution a cotton thread may be hung from the joints which,



Novelties.—Fig. 4.—O'Neil's Adjustable Cap for Shaper Bits.

taking fire, will serve in some cases to give the alarm more quickly. From the above brief description a general idea may be gathered of the working of the alarm, the advantages claimed for it being simplicity, reliability and the absence of electric batteries or similar accessories. The inventor is Prof. C. H. Judson, Greenville, S. C.

New Tenoning Machine.

Fig. 5 represents what Messrs. Joseph O. Colladay & Bro., No. 626 Race street, Philadelphia, describe as their No. 3 modern sash and blind tenoner. It is built entirely of iron and steel. By a patented device both heads can be raised or lowered together without altering the thickness of the tenon. Either head can be adjusted without lowering the position of the other. This is accomplished by means of a single screw, and the makers guarantee the movement positive and one not likely to get out of order. The top headstock is adjustable laterally

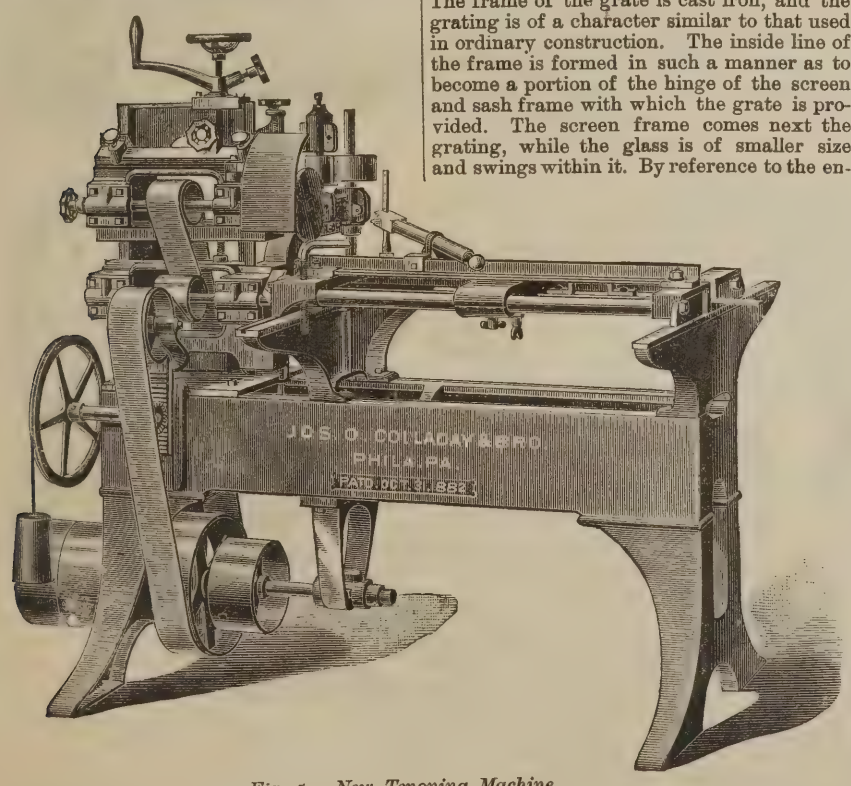


Fig. 5.—New Tenoning Machine.

for variation of shoulder. The boxes carrying the top head spindle are connected and slide in gibbed ways. The copes are attached to the headstocks, move with them, and have both vertical and lateral adjustment. The belt that drives the cutter-head shafts is placed centrally between the boxes. To this feature the makers direct attention as being far superior to driving from the end. The belt, when once laced together, requires no alteration, as the binding pulley operates against the loose side of it, by means of a weight and pulley, which keeps the belt tight and self-adjustable. The carriage is light, and is gibbed to the track. It works with great ease, and is provided with all the necessary stops, extension-rod, &c.

Combination Cellar-Window Grate.

In Fig. 6 we show a new article in the form of a cellar-window grate which is now being put on the market by J. S. Thorn, 1201 Callowhill street, Philadelphia. L. E. Snow, of No. 28 Central street, Boston, is the Eastern agent. The article shown is known as the Byar patent combination cellar-window grate, screen and sash. Its general features are so clearly shown in the engraving as to require very little description. The frame of the grate is cast iron, and the grating is of a character similar to that used in ordinary construction. The inside line of the frame is formed in such a manner as to become a portion of the hinge of the screen and sash frame with which the grate is provided. The screen frame comes next the grating, while the glass is of smaller size and swings within it. By reference to the engraving it will be seen that the two swinging parts can be opened at once, or that the glass alone can be open, according to circumstances. These goods are being made in various styles adapting them to different requirements. The frames are furnished with either segment or square tops, and they

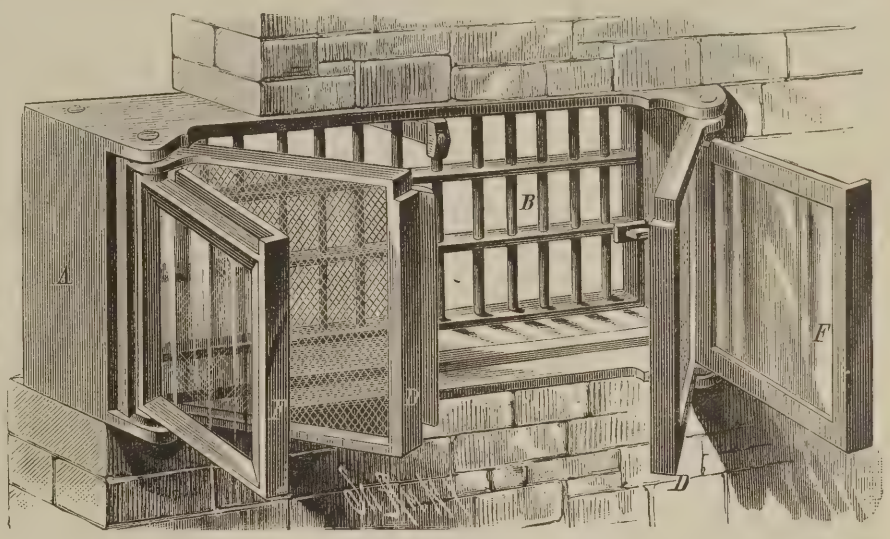


Fig. 6.—The Byar Combination Cellar Window Grate, Screen and Sash.

are of a character to be put in old buildings as well as new when circumstances demand. In addition to cast iron these goods are being made of wrought iron. The special advantages to which attention is directed in the manufacturer's circular are as follows: No wooden frames are required inside or outside. When the grates are shut they are perfectly tight, keeping out the cold, and yet are so arranged that they can be changed from closed grates to open grates. These grates always admit light. There are no old carpets, shavings, straw or other materials stuffed into the openings, which darken the cellar while keeping it warm. Ventilation is readily secured during warm days in winter, which is practically impossible by the old method. Their construction is such as to keep out flies, mice and vermin generally, making them very acceptable to tidy housekeepers.

Improvement in Spring Butts.

A new double-acting spring butt is being put upon the market by the Chicago Spring Butt Company, 167 South Clark street, Chicago, the general features of which will be understood by inspection of Figs. 7 and 8, the first showing the butt itself, and the second showing its appearance when in place on a door, the door being swung open. The spring is not contained in the butt, but is placed in a connecting case between two three-leaved butts. Under these conditions it is possible to use a larger and longer spring, with the additional cost only of the connecting strips or spring case. By these features the company avoid the clumsy

Fig. 7.—Chicago Double-Acting Spring Butt.

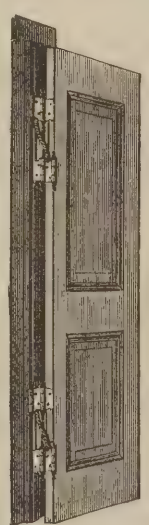
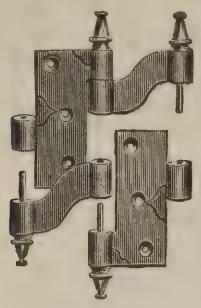


Fig. 8.—The Spring Butt in Place on a Door.

appearance usual with spring butts where the spring is contained within them. The fact that one spring only is used in each butt, and is attached to the center of the bottom and the top of the center leaf, gives the spring a purchase in closing the door equal to the distance from the axis to the center of the leaf. The spring uncoils, exerting some force in this direction, and, in addition, acts against the door by reason of the shape into which it is forced by the



Novelties.—Fig. 9.—The Chicago Blank Butt.

act of opening the door. The general appearance of the spring with the door open illustrates this. The manufacturers state that by drawing a top and bottom pin on opposite sides one outside leaf is released to apply to the door. When replaced this will allow the other outside leaf to be taken off in the same way to be applied to the jamb, the tension being on the spring during the operation. When the door is closed the spring is entirely concealed, giving the door the appearance of being hung with ordinary butts. The friction is very slight, so that, it is stated, these butts work as well without oil as common butts. Doors may be removed by drawing out the pins. In order to cheapen the cost of these goods when applied to doors, especially in cases where the doors are so light as to make one spring sufficient for the purpose, a blank butt of the kind shown in Fig. 9 is furnished, which is so constructed as to be used in combination with the spring hinge. Brainard & Co., 125 Chambers street, New York, are the Eastern sales agents for these goods.

Wood-Worker's Handy Router Plane.

The tool illustrated in Fig. 10, is entirely novel in its present form, and yet has numerous uses, and for every class of workers in wood. To smooth the bottom of grooves, panels or any depression below the general surface in wood-working has not been an easy task, and mechanics have resorted to various devices of their own to

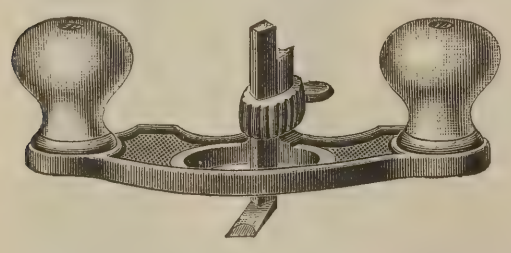


Fig. 10.—Wood-Workers' Handy Router Plane.

accomplish that end. Ordinarily, a block of wood is put in form, and to it a plow-iron or a chisel is fastened by some method suited to the immediate work in hand, the form or method of fastening being temporary, and requiring time to fit up for every variety of use as it comes along. This tool, now offered to mechanics in a compact and durable form, and ready for all the uses required, is properly named the wood-worker's handy router plane. It is especially useful to stair-builders. Two cast-steel bits (¼ and ½ inch) accompany each tool, and the form of the shank, as related to the slots in front and rear of the upright post, admits of the bits being clamped to the post in six distinct positions, thereby providing for the whole variety of work which has heretofore been done by means of temporary expedients. The Stanley Rule and Level Company, of New Britain, Conn., and 29 Chambers street, this city, are manufacturing this new plane.

Improvement in Saw Handles.

Messrs. Richardson Brothers, of Nos. 15 to 27 River street, Newark, N. J., are putting upon the market key-hole, compass and pruning saws fitted with adjustable handles that are of more than usual interest to mechanics who make use of goods of this kind. Two styles are illustrated in Figs. 11 and 12. In Fig. 12 a wooden handle is employed, the blade being held by means of a loop which draws the shank of the blade against two rivets passing through the handle, and the latter being fastened by a thumb-screw. This construction admits of the use of different blades with the same handle, and the ready insertion of a new blade in case of breakage. The second form of handle is shown in Fig. 11, and is of iron. A similar principle is employed for holding the blade in place, but the construction is such that the blade may be inserted either from the side of the handle, as shown in the cut, or from the end in the usual manner. The advantage of a handle placed as shown in Fig. 11 under certain circumstances will be appreciated by our readers generally. Various sizes of blades adapted for different purposes are furnished with either of the handles here illustrated.

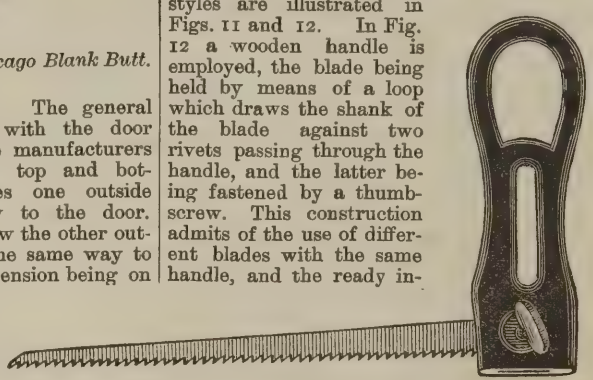


Fig. 11.—Adjustable Iron Handle.

Copper Shingles.

While the subject of copper roofing is before the attention of architects and builders, every item of information relating to methods of working copper for roofing purposes is of interest. We have in the past illustrated several different forms of metallic shingles or tiles, describing them as new forms of tin roofs. But it must be evident to our readers that any construction that is advantageous for use with one sheet metal is also desirable for others, and to this point the makers of these metallic tiles are directing attention at the present time. Copper roofing tiles or shingles are being made by several firms. On this general subject the Anglo-American Roofing Company, No. 22 Cliff street, New York, write us as follows:

After years of extensive trial, we have for general purposes settled upon two special forms of laying copper, iron and tin roofs, viz., the "dove-tail" and the "iron-clad" style. We formerly made and sold a few copper roofs of our old Comstock pattern, but the cost of furnishing and laying those shingles was too expensive for general use. Our dove-tail copper roofing, however, can be made and laid cheaper than any form of copper roofing we have yet seen on the market. Indeed, the cost of laying these shingles in either copper or tin ought not to exceed ½ cent per square foot. These plates are 15 x 15, and lay 12 inches to the weather, and therefore take 100 shingles to the square. They have a handsome appearance, and are adapted, from their peculiar construction, to

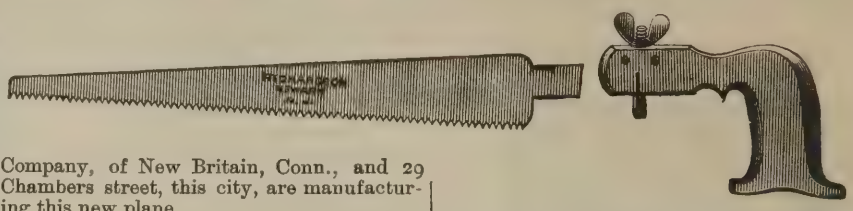


Fig. 12.—Improvement in Saw Handles.—Adjustable Wooden Handle.

be laid almost as tight as though they were soldered, and skilled labor is not required to lay them. Each shingle when laid is practically dove-tailed to its neighboring shingle, and so perfectly are they fastened and locked together that a square of them can be lifted up and held perpendicularly without a single shingle falling out of place, and this can be done before a nail is driven. Notwithstanding this, ample provision is made for contraction and expansion under variations of temperature, so that the shingles practically combine all the advantages of a soldered-plate roof with those of a roof made up of small plates, each capable of independently accommodating itself to heat and cold.

Empire Scroll-Saw.

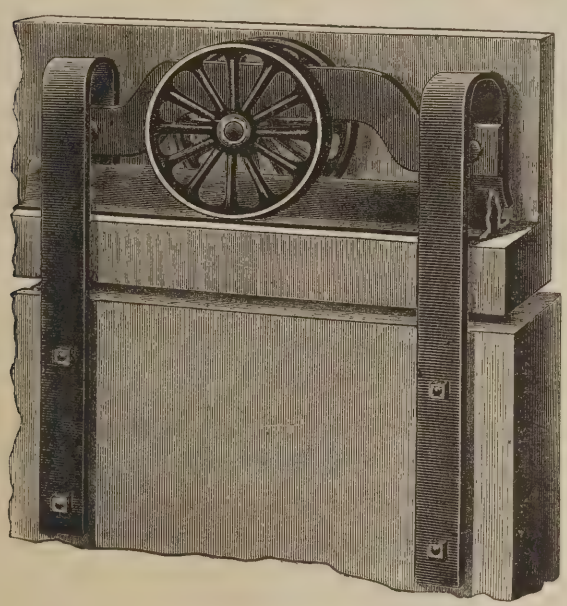
In our issue for last month we presented an illustration and description of one of the new scroll-saws which the Seneca Falls Mfg. Co. have recently put upon the market. We now present a second, which differs materially from the device to which attention has already been called. The general appearance of the saw in use is shown in Fig. 13 of the engravings. Like the one to which we previously directed attention, it is a grade above the ordinary amateur tool, and is strong, durable and practical in all its parts.

Fig. 13.—The Empire Scroll-Saw.

The manufacturers state that it will cut up to 3 inches in thickness and will swing 24 inches. Its wooden arms operate upon an entirely new principle, being pivoted in such a manner as to do away with side motion. This feature, in connection with self-adjusting saw clamps with which the machine is provided, it is said, gives an almost entirely straight up-and-down motion to the saw blade. The table is iron, polished and nickel-plated, and is arranged to tilt so that it can be changed to any angle for sawing inlaid work. The driving-wheel is 24 inches in diameter and the driving-belt ½ inch V-shape. The machine is provided with double foot treadle, with a walking motion, by which great power can be obtained with less fatigue than by other devices. This saw is also arranged for steam-power when desired. It has a drill attachment provided with an "Empire" drill chuck, adapted to different sizes of twist drills. The "Victor" lathe attachment, described last month, is applicable to this machine.

The Victor Door-Hanger.

The form of door-hanger manufactured by the Victor Mfg. Co., 116 Water street, Newburyport, Mass., is shown in Fig. 14 of the engravings. The general features of construction employed will be recognized by inspection of the engraving. It is of the general character known as anti-friction, in which the travel of the door is both upon and with the wheels. The latter are flat, running on the flange of the rail. The manufacturers direct attention to the strength and simplicity of this device, and also to the fact that it is silent in operation. They assert that it occupies less space than any other hangers, and has the further advantage of requiring no oil. It is convenient for transportation on account of packing snugly. Three sizes are made, the smallest suitable for doors from 3 to 6 feet wide, the second size for doors 6 to 9 feet wide, and the largest for doors 9 to 12 feet wide. The rail is furnished in 2-foot lengths.



Novelties.—Fig. 14.—The "Victor" Door-Hanger.

Preserving Timber.—Among methods which have been brought forward for the preservation of bridge timber and railroad ties is one which subjects the finished timber to an adequate dry heat, and then immerses it in a hot bath composed of certain proportions of asphalt and carbolic acid. The effect of this treatment is that, on cooling, the solvent of the asphalt evaporates, leaving a skin of coating of asphalt on the surface of the wood, which resists water, and keeps the antiseptic material fixed securely within the pores of the wood. The exterior of the wood, on the completion of this process, presents a smooth and dark surface, requiring no paint. The efficiency of this treatment depends in a great measure upon the condition of the wood before it is applied. If the wood be wet or green, fostering the moisture within, in this manner, will probably do more harm than good.

Difficulties in Building in Winter.

Limes and cements, says a contemporary, are liable to injury from frost if not thoroughly set or sufficiently hardened, the line of demarcation between setting and hardening being by no means clear, although said to be determined by the loss of plasticity. When this is quite lost, however, crystallization has ensued, and consequently hardening, though not to its full extent. Besides, what becomes of the phrase "settling hard" if mortar does not harden until after it sets? Evidently another term is required to denote ultimate induration, as opposed to the hardening acquired by crystallizing. Lime mortar has been known to set so extremely hard that it has defied all fair means to injure it when only two days old. Frost does not usually penetrate into mortar joints to a greater depth than ½ inch or thereabout, and common pointing that will never indurate (however picturesque it may be made to look with lampblack or otherwise) is chiefly affected by it. This sort often stands when frozen, but peels or scales off when thaw sets in. Perhaps few incidents have caused more bickerings between builders and their supervisors than the failure of pointing from frost, and this because the contract has not enjoined that the work was to be delivered up complete and sound, with all damage or imperfections that may have arisen during its progress repaired, rectified and made good. Pointing executed with strong lime and little sand, well troweled and consolidated by pressure into the raked-out, cleaned, brushed and wetted edges of the bricks, is, like a good struck and cut joint, more adapted to remain unimpaired during a severe winter than a tuck-pointed joint, however accurately trimmed. When not brought to a smooth, impervious face, joints remain porous and are in danger of disfigurement from frost. A like disaster may happen when they are not weathered to throw off water, or through an exudation of the water of crystallization occurring during a freezing temperature. The porosity of Portland cement induces stucco made therewith to flake and peel off in frosty weather if cracked or laminated through careless admixture or rendering. This cement retains in setting a considerable portion of the water used in bringing it to a paste, and, notwithstanding that it sets quickly and parts with all superfluous water, it takes months to indurate and dry.

Frost is doubtless particularly detrimental to all green work, which requires, therefore, efficient protection in the shape of boards, straw and such like coverings. External work must not be proceeded with during frost, nor while frost is in the materials. In the one case there will be upheaval, followed by collapse, and in the other destructive settlement. Buildings, however, already roofed in can be advanced during frost by stopping doors and windows with screens and lighting fires. Concrete, which plays so important a part in the stability of structures, should never be made in frosty weather. In spite of this fundamental precept some imagine that it can be done with impunity, because hot lime will take the frost out of the ballast, without reflecting as to the effect on the ultimate hardening its rapid rate of cooling may exercise. Concrete made in temperate weather, and exposed to frost, sometimes shows minute cracks on its surface that are the result of contraction, but these are too insignificant to interfere with the permanent expansion of concrete properly prepared with hot lime or cement, and which, by its great lifting power, affords so splendid a means of underpinning. Portland-cement concrete compounded in frosty weather suffers a retardation in setting, and, consequently, its perfect cohesion may be fairly suspected when it eventually consolidates.

It would thus appear that, in addition to its powers of weakening, disrupting and thawing, frost furthermore affects building materials by squeezing them as far as its severity will permit. It is also evident that the divergence in their relative loss of bulk, through contraction, is too trifling—excepting in the case of continuous girders, &c., unprovided with expansion arrangements—to produce anything like dislocation when mixed up in a building, and attaining or not an approximately equal temperature. The sensation of cold, which is misleading, would give the idea that such an attainment is impossible, since stones and metal feel so much colder than timber. All inert bodies, however, exposed to the same temperature, acquire it within a reasonable time. There are, of course, instances where an even temperature is never reached, as in the case of chimneys, &c. As to the motion superinduced by contraction and expansion, slight as it is, it no doubt produces countless fine cracks or threads in masonry and mortar joints, and perhaps helps to explain why old work can be lifted off sometimes piece by piece, or taken down with so much ease. In habitable structures, parts of chimneys, rooms, &c., or of the same constructive piece, its interior, ends and sides, for example, are unequally, irregularly or intermittently warmed and chilled day by day, and all the year around, throughout a wide range of temperature, whereby another class of cracks arise that are wrongly attributed to settlement, imperfect seasoning, inequality of bearing, &c., according to the nature of the thing affected, but which reach their maximum by the aid of frost. Then there are other points, such as the rate of cooling, specific heat of materials, &c., besides the puzzling question why foundations are left like buried pipes to go with the ground, whereas the superincumbent walls and what they carry have ample room, though no facilities for motion similarly to iron rails, girders, ribs or piping provided with elongated bolt holes, expansion joints, sliding joints or friction rollers, as severally required. Thus the whole subject of the total debilitating effect of frost on a building becomes very complex.

Bricks Made of Glass Sand.

M. Hignette in the *Bulletin Technologique des Ecoles Nationales d'Arts et Metiers*, says an exchange, describes a new ceramic product from the waste sands of glass factories, which often accumulate in large quantities, so as to occasion great embarrassment. The sand is subjected to an immense hydraulic pressure, and then baked in furnaces at a high temperature, so as to produce blocks of various forms and dimensions, of a uniform white color, which are composed of almost pure silex. The crushing load is from 370 to 450 kg. per square centimeter (between 2 and 3 tons per square inch.) The bricks, when plunged in chlorhydric and sulphuric acids, show no trace of alteration. The product has remarkable solidity and tenacity; it is not affected by the heaviest frosts or by the action of sun or rain; it resists very high temperatures, provided no flux is present; it is very light, its specific gravity being only 1.5, and it is of a fine white color, which will make it sought for many architectural effects in combination with bricks or stones of other colors.

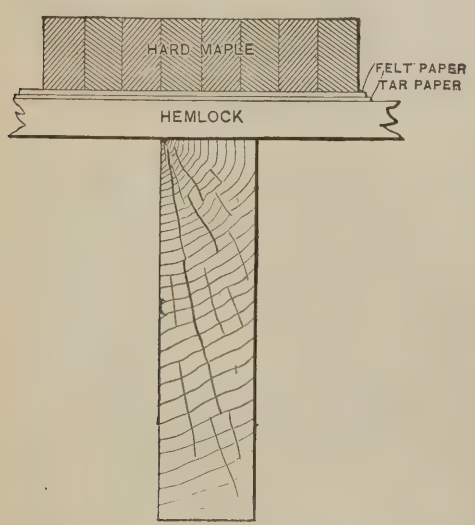
A new process for drying lumber is attracting attention. It consists in surrounding the wood with common salt. In ordinary kiln-drying the albumen is killed or destroyed, and the surface dies out first, thus sealing the juices inside, to escape eventually through cracks caused by the uneven expansion of the wood. The new process is said to be better in this respect.

Roller Skating Rink.

The general interest that is being manifested throughout the country at the present time in the form of amusement known as roller skating makes the accompanying engravings, which represent a building erected especially for this purpose, both timely and useful. The Temple Rink, built by the New Jersey Rink Company, of Elizabeth, N. J., a few months since, is typical of many buildings of its class throughout the country, not only in character of construction and appointments, but also with respect to the rapidity with which the work was executed after the scheme had been entered upon. The building shown is the property of a company that was organized on the 30th of August last year ; the plans were commenced on the 3d of September ; excavation was begun the day following, and the first entertainment was given on the evening of November 1. From this it will be seen that the work was rapidly pushed to completion, not only in respect to the plans, but also in the putting together of the materials out of which the building is constructed. The plans were prepared by Mr. D. B. Provoost, a well-known architect of Elizabeth, to whom we are indebted for the following general particulars ·

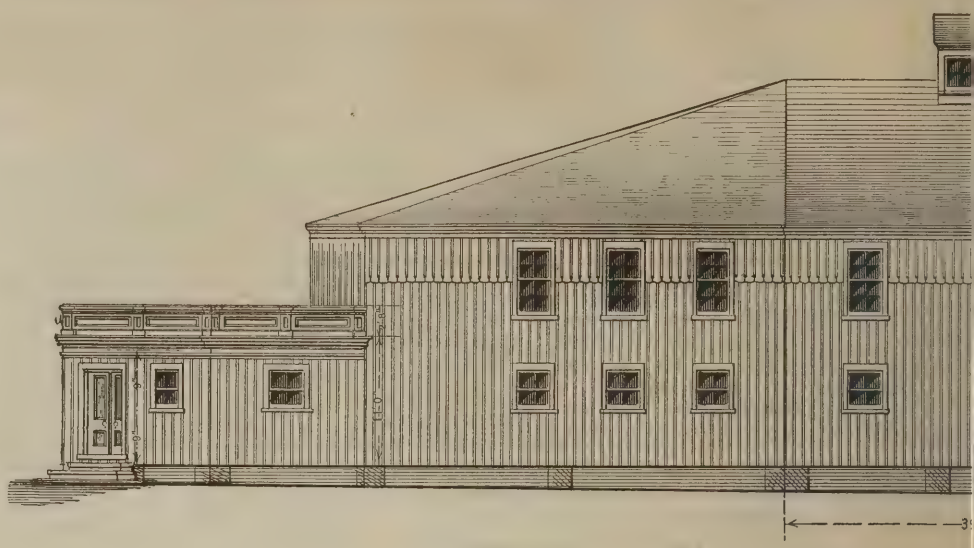
The lot on which the building is located is of peculiar shape, as will be seen by examination of the ground plan, and this made it necessary that the building should stand diagonally upon it, thereby gaining a greater depth to the structure, and suiting the angles of the octagonal form to the boundary lines. The wings on each side of the building extend up two stories in hight, thus giving space for stair ways, ladies' parlor and toilet-room, also to restaurant, and at the same time act as trusses on the sides of the building. The tie beams of the trusses, which come opposite these wings, stand over the outside of the wing walls.

The girders and floor beams of the skating floor are laid independent of the main sills and promenade platforms. They are connected only by a plate between the floor beams and the platform beams. The general dimensions of the timbers used in this building may be gained by inspection of the several engravings. The main tie beam in the trusses is composed of four thicknesses of 2-inch spruce, 14 inches wide. The stuff

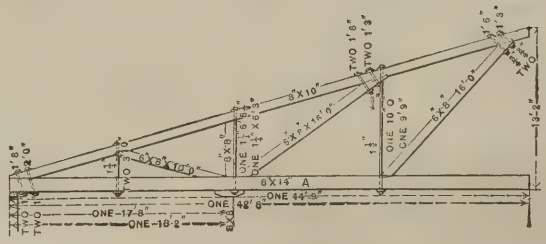


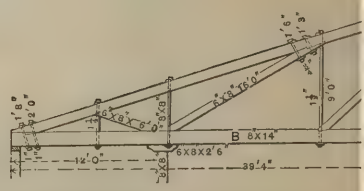
Section Showing Floor Construction.—Scale, 3 Inches to the Foot.

used is 20 feet in length, and joints are broken 5 feet apart, the pieces being bolted together with ⅝-inch bolts drawn against cast-iron washers. The half trusses over the octagon ends, details of which are presented herewith, are braced against the main truss and rest on heavy cast-iron shoes. The two end trusses, against which these half trusses rest, are provided with 2-inch iron rods in place of king posts. They are further strengthened by a 1½-inch rod from the center of the shoe to the top of the truss, and connected to a heavy peak washer. The half trusses act as braces for the ends



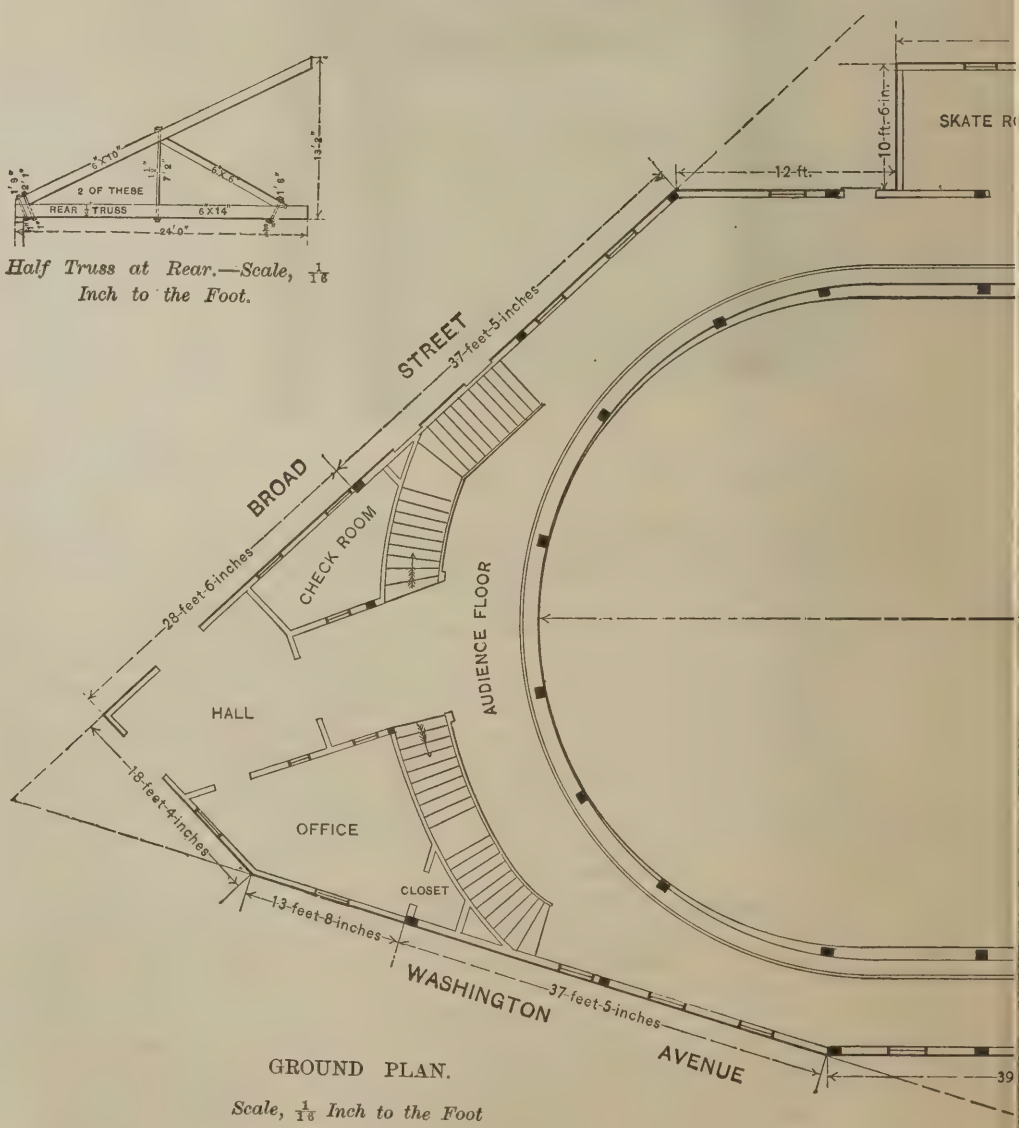
ELEVATION ON





DETAILS WITH FIGURED D

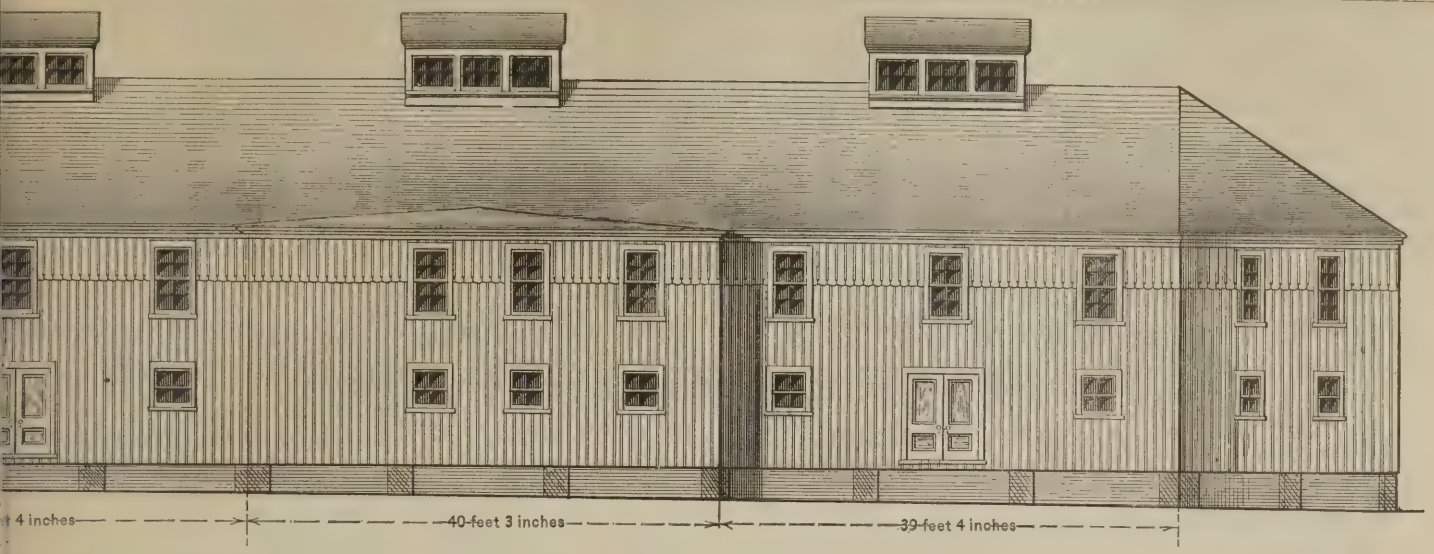
Half Truss at Rear.—Scale, $\frac{1}{16}$ Inch to the Foot.



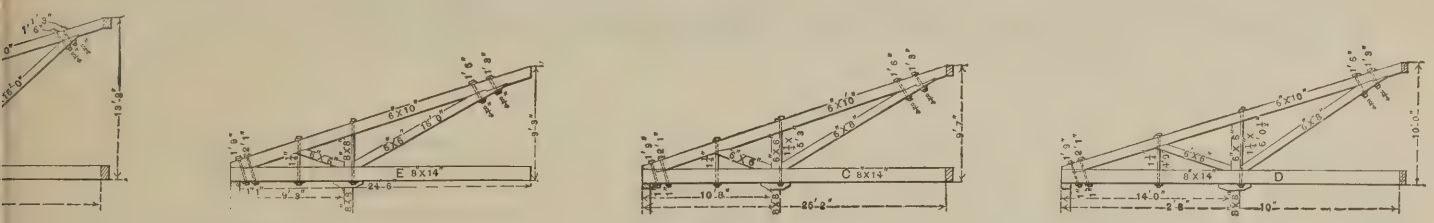
GROUND PLAN.

Scale, $\frac{1}{16}$ Inch to the Foot

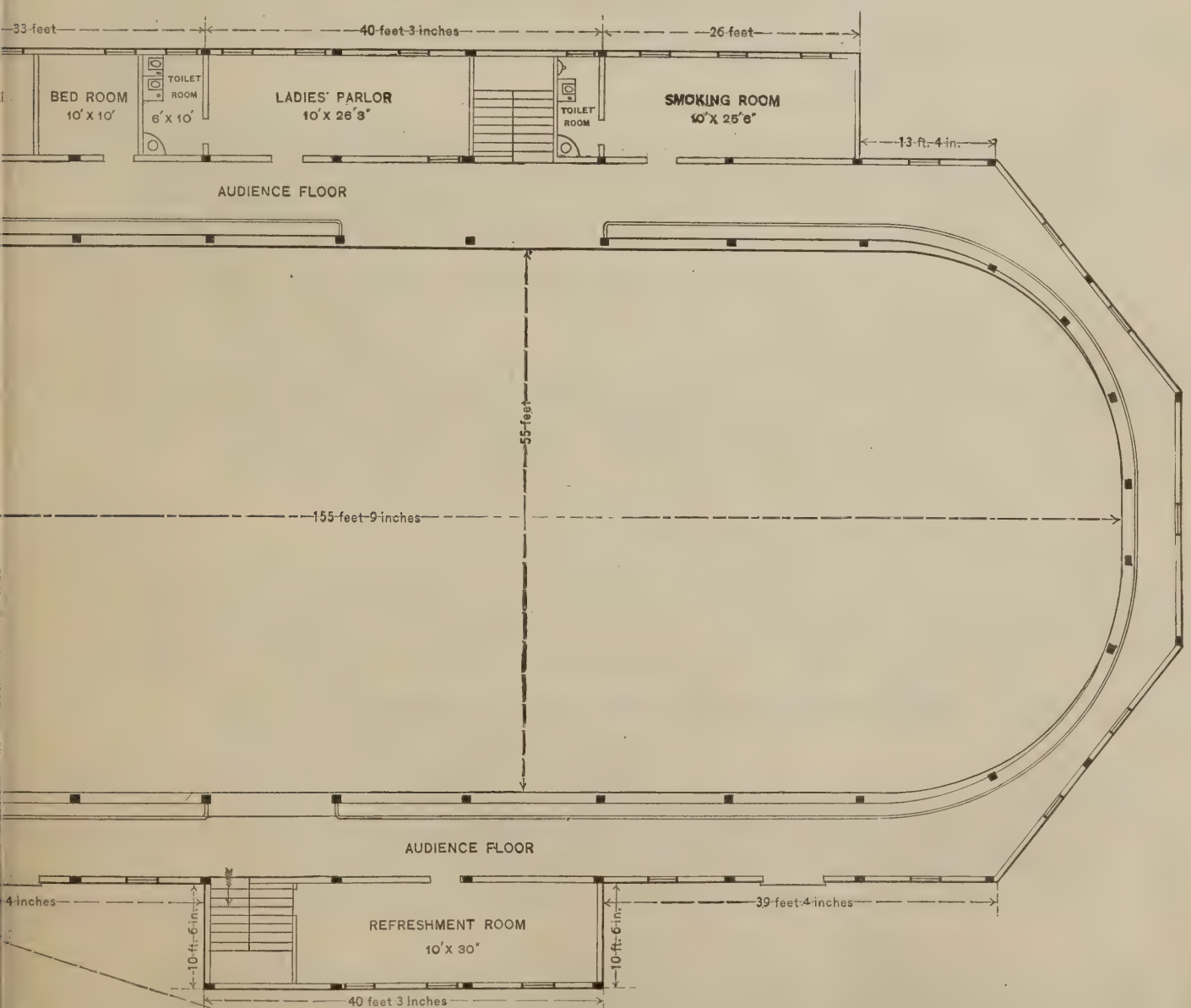
TEMPLE RINK, AT ELIZA



SHINGTON AVENUE, SCALE, $\frac{1}{16}$ INCH TO THE FOOT.



ENSIONS OF HALF TRUSSES.—SCALE, $\frac{1}{16}$ INCH TO THE FOOT.

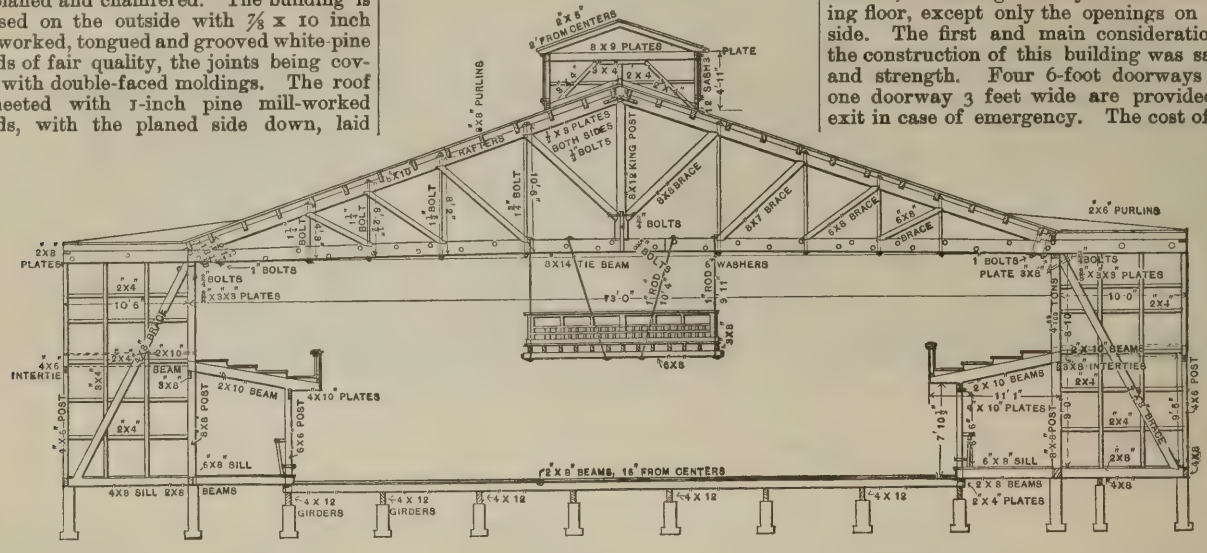


ETH, NEW JERSEY.—D. B. PROVOOST, ARCHITECT.

of the building. The purlins of the roof are 3 x 8 inches, and are placed 3 feet from center to center. The trusses, purlins, posts, also gallery posts and plates, and the plates and timbers around the ventilators, are planed and chamfered. The building is inclosed on the outside with ⅞ x 10 inch mill-worked, tongued and grooved white-pine boards of fair quality, the joints being covered with double-faced moldings. The roof is sheeted with 1-inch pine mill-worked boards, with the planed side down, laid diagonally and nailed. A neat cornice finishes the eaves. The roof is composed of three-ply paper, made with paint instead of tar, nailed, and covered with a coating of hot tar and pitch. The paper used was prepared by W. H Rankin, of Maiden Lane, New York, and, we are assured from the architect's experience, has proved superior to other roofing materials previously tested. It is noiseless during rain or hail storms, and is free from the liability of sweating, which is an objectionable feature of metal roofs.

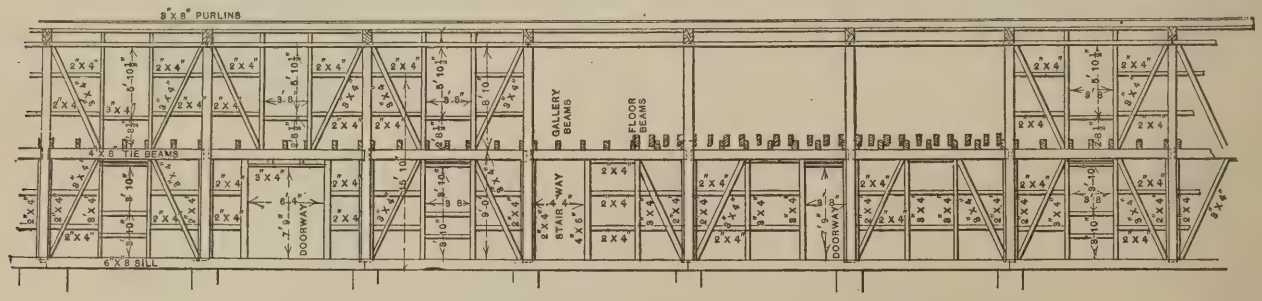
The skating floor is laid with one thickness of 1-inch mill-worked hemlock boards, laid diagonally and nailed to the floor timbers. This surface is covered with one thickness of tarred paper, to prevent dampness, and one thickness of deafening paper. Over this a hardwood floor composed of ⅞ x 2 inch seasoned and kilndried hard maple, dressed on four sides and laid on edge, is placed. A strip of this flooring was first laid through the center of the building, about 10 feet wide, with the ends cut to a circle to correspond with the circular ends of the building. The remainder of the floor was then bent around these circular ends and laid in continuous lengths. The other floors of the building are composed of 1 x 5 inch spruce flooring. In planing off the hardwood floor, planes with narrow irons were used. The floor was dampened, and was traversed across the grain to true level, and was afterward scraped and finished by being carefully sand-papered. The outside walls and inside partitions are ceiled with a good quality of mill-worked, tongued and grooved, beaded white-pine boards, ⅞ x 4½ inches. The gallery front and the under side of gallery are ceiled in the same manner. The gallery front is finished with a 2 inch white-pine cap and bed molding.

The outside piers and those under the gallery posts are 12 x 24 inches; all others are 12 x 12 inches, and were started 3 feet below the surface of the ground. The building is heated throughout with steam, the boiler being located in a detached building. It is lighted with gas, the main room having four Siemens regenerative burners of 42 feet capacity each, provided with reflectors. The building is painted on the outside two coats of olive green, in two shades, and trimmed with Indian red. The music gallery is suspended from the trusses by iron rods, and is reached by a hinged stepladder held up by cord and weight. The gallery is furnished with 700 chairs, while the space under the gallery is devoted to promenading. Seats with backs are provided for the skaters, extending entirely around the skating floor, except only the openings on each side. The first and main consideration in the construction of this building was safety and strength. Four 6-foot doorways and one doorway 3 feet wide are provided for exit in case of emergency. The cost of the building, including heating and detached boiler-house, was in the neighborhood of $13,000.

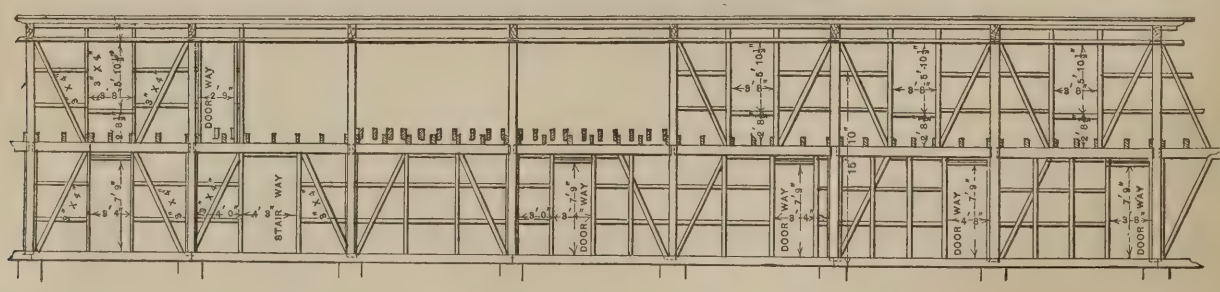


Temple Rink.—Transvere Section.—Scale, $\frac{1}{16}$ Inch to the Foot.

Plan of Transverse Trusses.—Scale, $\frac{1}{16}$ Inch to the Foot.



Longitudinal Section on Washington Avenue.—Scale, $\frac{1}{16}$ Inch to the Foot.

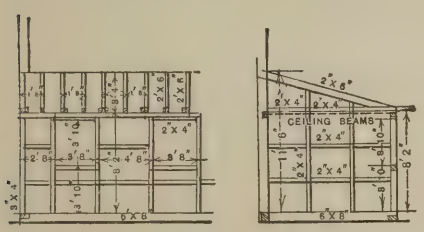


Longitudinal Section on Opposite Side.—Scale, $\frac{1}{16}$ Inch to the Foot.

How Wood is Made.

In many trees the annual layers are so regular, and seem to be placed so nicely, that one not a botanist might be pardoned for believing that the sap was changed to wood matter in the leaves, and the new-formed matter sent down, sliding over the old layer like the section of a telescope; but, though the wood was prepared by the leaves in a great measure, the actual growth was made by the germination of some of the cells along the whole outside wall of last year's wood beneath the inner bark. The germination of the cells takes place about the middle of June. Take a healthy cherry tree and strip it entirely of its bark to any length desired. At that season a viscid liquid will be found covering the woody surface in abundance. The stripped part is covered with a cloth to prevent evaporation, and in a few days numerous dots, like

needle points, will be seen about $\frac{1}{16}$ inch apart all over the surface. These are the young cells which have germinated from those of last year. They continue germinating, one from the other, until they meet, when they unite and form a complete surface. In the autumn a layer of wood will be found just as thick as in the part of the tree not disbarked, and a single layer of liber, with its outer coat of cellular matter—perfect bark—will have been formed over the whole. The entire formation of wood and bark can thus be seen by the ordinary observer, without the necessity of any nice microscopical work. The experiment has been tried with other trees. Large apple trees that have had their bark peeled wholly off from their trunks have, at the season named, made an entire new layer of bark and wood, not only with no injury to the tree, but to its manifest enjoyment. By this experiment we learn that there is no difference primarily in any part of the annual covering. The same cell may become permanent tissue or generating tissue, and from the generative tissue, may come, before the season of growth closes, every form of structure known to anatomists, from pure wood to the outermost cuticle of the bark.



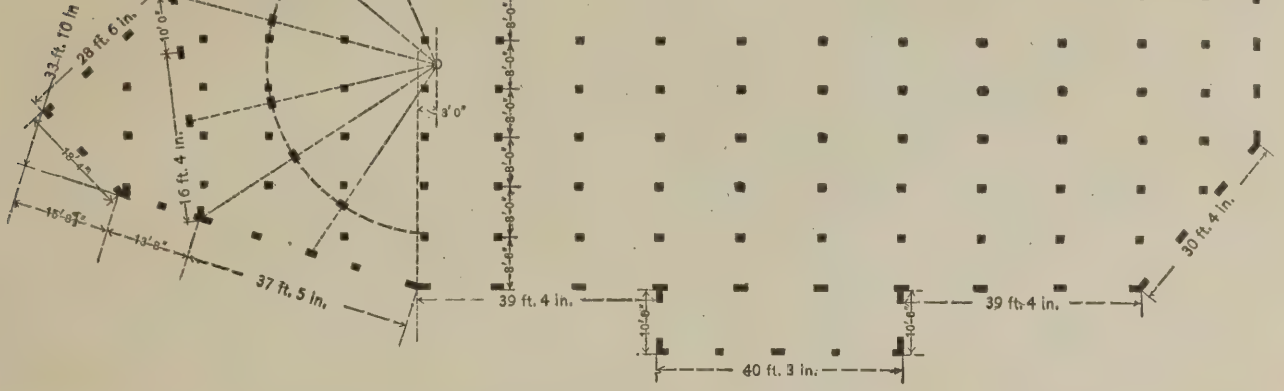
Scale, 1-16 Inch to the Foot.

One Story Extension. *Cross-Section of Extension.*

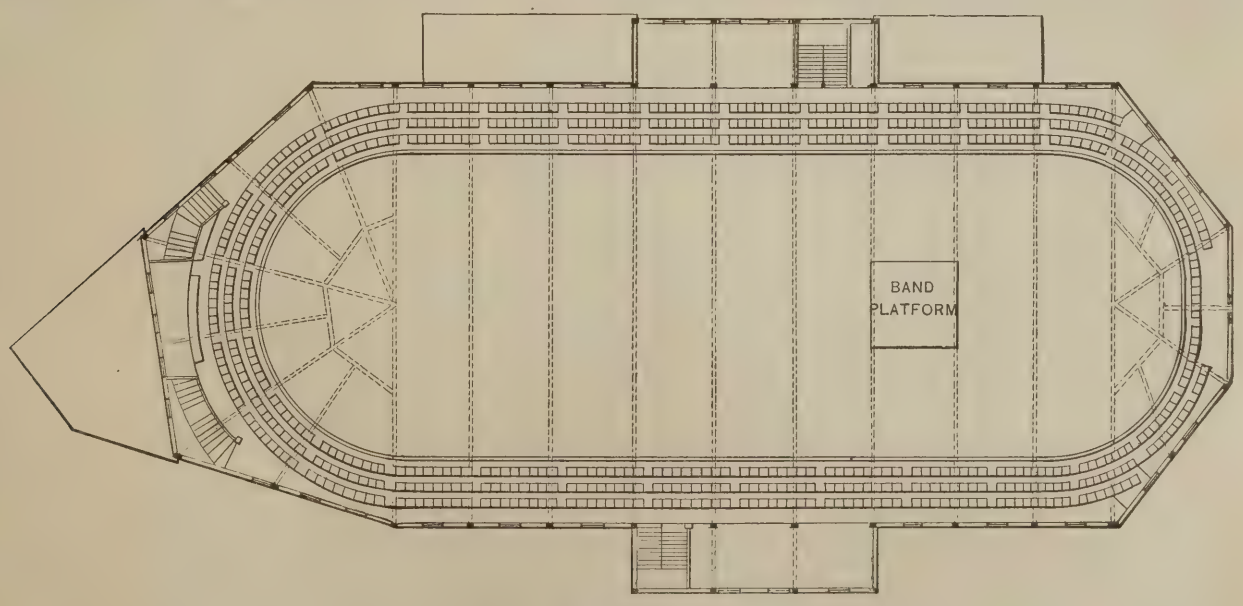
Determining the Quality of Slate.

The following methods of determining the quality of slate are given by Gwilt, and, although written many years ago, are in many respects as applicable at the present date as for those to whom the remarks were specially addressed: A fine, sound texture is the most desirable among the properties of a slate, for, the expense of slating being greatly increased by the boarding whereon it is placed, if the slate absorbs and retains much moisture the boarding will soon become rotten. But a good slate is very durable. Its goodness may readily be judged by striking it as a piece of pottery is struck; a sonorous, clear bell-like sound is a sign of excellence, but many pieces of the slate should be tried before a conclusion can be arrived at. It is thought to be a good sign if, in hewing, it shatters before the edge of the ax. The color also is some guide, the light blue sort imbibing and retaining moisture in a far less degree than the deep black-blue sort. The feel of a slate is some indication of its goodness; a good one has a hard and rough feel, while an open, absorbent slate feels smooth and greasy. The best method, however, of testing the quality of slates is by the use of water in two ways. The first is to set the pieces to be tried edgewise in a tub of water, the water reaching above half-way up the hight of the pieces; if they draw water and become wet to the top in six or eight hours' time, they are spongy and bad; and as the water reaches less up them, so are the pieces better. The other method is to weigh the pieces of slate and note their weights. Let them remain for 12 hours in water and take them out, wiping them dry. Those that on reweighing are much heavier than they were previous to their immersion should be rejected. Where the character of a slate quarry is not previously known, experiments of these sorts should never be omitted.

We receive many inquiries as to quality of glue. A good glue should contain as little saline matter as possible. When buying the article venture to apply your tongue to it, and if it tastes salt or acid reject it for anything but the commonest purposes. The same operation will also bring out any bad smell the glue may have. These are simple and ready tests, and are the ones usually adopted by dealers and large consumers.



Temple Rink.—Foundation Plan.—Scale, $\frac{1}{32}$ Inch to the Foot.



Gallery Plan.—Scale, $\frac{1}{32}$ Inch to the Foot.

TRADE PUBLICATIONS.

Terra-Cotta.

The new catalogue issued by Messrs. True, Brunkhorst & Co., Chicago, Ill., doing business under the style of Northwestern Terra-Cotta Works, is an oblong pamphlet measuring 11 x 16 inches, and containing 26 plates. The cover may be described as red terra-cotta in color, on the first page of which, an effective and appropriate design by P. C. Lautrup, is printed in black. The fourth page shows a view of the kilns of the company, the inside pages being blank. We are thus particular in describing the cover, for it is one of the best features of the work. Owing to an unfortunate selection in the way of paper and in the color of the ink in which the work has been done, the pages of the book proper are far less attractive than the labor expended in their preparation and the really meritorious work shown by the engravings would justify. The inside pages of the book are of a thick, soft paper, light olive in color, on which the designs are printed in sepia. Much of the effect that might have been produced at the same cost has been totally lost, and accordingly the book does not show in proportion to its real value. A number of the designs shown, which include almost everything that can be made to advantage out of terra-cotta, have been delineated by Mr. Lautrup. His drawing is spirited and is well adapted to the representation of the particular class of work under consideration. In the space that we can devote to the subject we cannot undertake to describe the patterns presented. Suffice it to say there is much in the work that will well repay study, and also much that is adapted to the every day requirements of architects and builders. The success of this firm in introducing terra-cotta in the Northwest is well known, and their catalogue should be in every office.

The Benner Iron Works.

The catalogue issued by Messrs. M. Benner & Co., 262 South Jefferson street, Chicago, Ill., contains 188 pages, and is profusely illustrated, the engravings showing more or less of almost every line of goods manufactured by or dealt in by this firm. Of these no less than 22 kinds are enumerated. The business of this house, in brief, is builders' ironwork, both wrought and cast, of every description, including fences, crestings, shutters, fire escapes, jailwork, beams, columns, &c. Of store fronts and columns none are shown, it being explained that for the most part architects prefer making their own designs. The illustrations are printed upon tints, in which are engraved the style of the firm and its location, so that every page of the work is an advertisement of the house putting it out, no matter how much it may be mutilated. A very handsome assortment of designs of fences, gates and railings is presented, among which are a number of very recent designs. Following this, one of the largest and best collections of crestings is given which we have recently had the pleasure of inspecting. These are accompanied by a judicious selection of finials, embracing a number of new designs. Window guards, stair railing, newel posts, balcony brackets, rosettes, scrolls and other similar work are presented. Jailwork is also illustrated. Lawn furniture, stable fittings, summer-houses, verandas, wrought chandeliers, shutters, vault lights and fire escapes go to complete the work. Some tables valuable to architects, engineers and builders are included in the book.

Emblematic Signs, Vanes, &c

Thomas W. Jones, No. 170 and 172 Front street, New York, has favored us with a copy of his catalogue of weather vanes, tower ornaments, finials, church crosses and emblematic signs. Mr. Jones is the successor in business to Charles C. Briggs and V. W. Baldwin. The catalogue is a large octavo of nearly 100 pages, bound in paper covers. The designs embraced cover the general run of stock work in this line of trade and a considerable number of new designs. The goods shown are for the most part made of copper and finished by gilding.

Copper and Brass.

We have received from Messrs. C. G. Hussey & Co., 49 Fifth avenue, Pittsburgh, a very handsome catalogue relating to copper and brass goods, of which this firm make a specialty. Each page is a distinct and complete circular describing some feature of the business which the firm conducts, or else presenting statistics or tables useful to the trades which work these metals. There are 14 pages in all, measuring 5 x 6 inches, which are contained within neat cover pages printed in colors. The cover and the interior are joined by a single fastening placed at the upper left-hand corner. Accordingly, the collection has somewhat the appearance of a book and yet is quite unlike it. The groundwork of the cover is a whitish cream color, with a sage green bordered across the top and down the left-hand side. "Copper" is printed near the top in a bronze closely resembling the appearance of a planished sheet of that metal, while "Brass" is printed near the bottom in a bronze more nearly resembling the color that it ordinarily shows. The firm name and their location appear in fancy letters in the body of the page. The interior sheets are of a very light blue paper of good weight, and are printed in a reddish-brown ink. Across the top of several of the pages relating to copper is a bronze background closely imitating that metal, on which the names of the special articles described appear in the color of the page. Plain sheet copper, O'Neill's planished copper and copper bottoms are introduced in this manner. Other pages relating to brass are printed in a similar manner so as to represent that metal. Information is given with reference to ordinary finish, cold-rolled, smooth finish, hard and soft copper, also tinned copper, odd shapes and various goods made out of copper. A page is devoted to remarks on the use of sheet copper for roofing valleys and conductors, and attention is directed to the present low prices of this metal, which should insure its more general introduction. Brass is similarly presented. Among the tables given in this catalogue may be mentioned Weights of Sheet Copper per Square Foot and Thickness of English Wire Gauge, and Weight of Copper and Brass Wire and Plates by American Gauge. As a trade publication this collection of circulars or catalogue, whatever it may be called, is unique and will well repay an examination upon the part of any who may receive it.

An Amateur Carpenter.

Bill Nye, in the Denver *Opinion*, relates his experience as an amateur carpenter, as follows:

In my opinion every professional man should keep a chest of carpenter's tools in his barn or shop, and busy himself at odd hours with them in constructing the varied articles that are always needed about the house. There is a great deal of pleasure in feeling your own independence of other trades, and most especially of the carpenter. Every now and then your wife will want a bracket put up in some corner or other, and with your new, bright saw and glittering hammer you can put up one upon which she can hang a cast-iron horse-blanket or lambrequin, with inflexible water lilies sewed in it.

I made a very handsome bracket last week, and I was naturally proud of it. In fastening it together, if I hadn't inadvertently nailed it to the barn floor, I guess I could have used it very well, but in tearing it loose from the barn, so that the two could be used separately. I ruined a bracket that was intended to serve as the base, as it were, of a lambrequin which cost $9, aside from the time expended on it.

During the month of March I built an ice-chest for this summer. It was not handsome, but it was roomy, and would be very nice for the season of 1884, I thought. It worked pretty well through March and April, but as the weather begins to warm up that ice-chest is about the warmest place around the house. There is actually a glow of heat around that ice-chest that I don't notice elsewhere. I've shown it to several personal friends. They seem to think it is not built tightly enough for an ice chest. My brother looked at it yesterday, and said that his idea of an ice-chest was that it ought to be tight enough at least to hold the larger chunks of ice, so thay would not escape through the pores of the ice-box. He said he never built one, but that it stood to reason that a refrigerator like that ought to be constructed so that it would keep the cows out. You don't want a refrigerator that the cattle can get through the cracks of and eat up your steawberries on ice, he says.

A neighbor of mine who once built a hen resort of laths, and now wears a thick thumb-nail that looks like a Brazil nut as a memento of that pullet corral, says my ice-chest is all right enough, only that it is not suited to this climate. He thinks that along Behring's Strait, during the holidays, my ice-chest would work like a charm. And even here, he thought, if I could keep the fever out of my chest, there would be less pain.

I have made several other little articles of *vertu* this spring, to the construction of which I have contributed a good deal of time and two finger nails. I have also sawed into my leg several times. The leg, of course, will get well, but the pantaloons will not. Parties wishing to meet me in my studio during the morning hour will turn into the alley between Eighth and Ninth streets, enter the third stable door on the left, pass around my Gothic horse, and give the countersign and three kicks on the door in an ordinary tone of voice.

Tin and Gravel Roofs Compared.

On a card issued by G. J. Holbrook, felt, cement and gravel roofer, 45 Montgomery street, Jersey City, we find the following presentation of figures which cannot fail to be of interest to all who have anything to do with roofing matters. The card is entitled "A Roof as an Investment":

The attention of owners, architects and builders, is requested to the following comparison between the cost of tin roofing and of gravel roofing for a period of years. The comparison is based on the supposition that a tin roof of good quality, kept properly painted, will, as is sometimes claimed, last 40 years, while the gravel roof is renewed every 10 years. No account is made of repairs. A gravel roof that is renewed every 10 years will certainly cost less for repairs than a tin roof that is required to last 40 years. Suppose two similar buildings, say of 10 squares each, one covered with a first-class tin roof, the other with a good gravel roof:

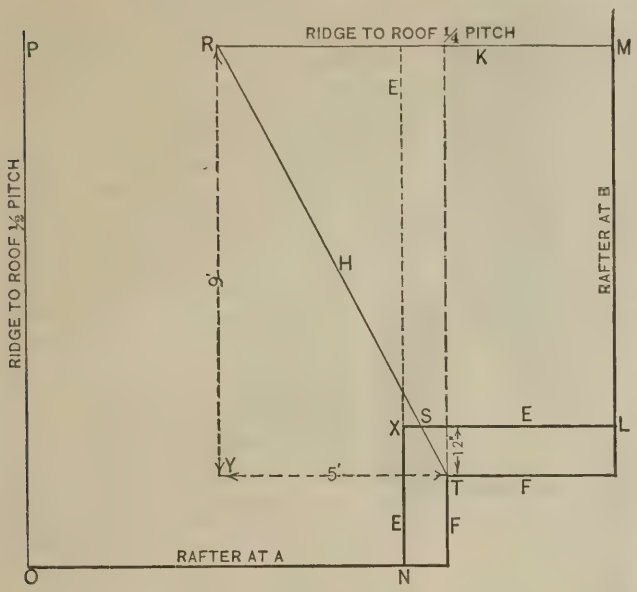
First cost—			
Tin roof.		Gravel roof.	
1000 square ft. at 7c.	$70.00	1000 sq. ft.	
2 coats of paint....	15.00	at 4 cents..	$40.00
Total....	$85.00		$40.00
Cost at end 10 years—			
10 yr. int. on cost...	51.00	Int. on cost.	24.00
5 coats of paint....	50.00		
Int. on cost of paint.	12.00	New roof...	40.00
Total.....	$198.00		$104.00
Cost at end 20 years—			
10 yr. int. on cost...	118.80	Int. on cost.	62.40
5 coats of paint.....	50.00		
Int. on cost of paint.	12.00	New roof...	40.00
Total..... ..	$378.80		$206.40
Cost at end 30 years—			
10 yr. int. on cost..	227.28	Int. on cost.	128.84
5 coats of paint....	50.00		
Int. on cost of paint.	12.00	New roof...	40.00
Total.....	$668.08		$370.24
Cost at end 40 years—			
10 yr. int. on cost..	400.85	Int. on cost.	222.14
5 coats of paint....	50.00		
Int. on cost of paint.	12.00	New roof...	40.00
Total..... .$1,130.93			$632.38

From the foregoing comparison it will be seen that the building covered with the gravel roof has cost, including the new roof that makes its period 50 years, about $500 less than the building covered with tin. The experience of the best gravel roofers is that their roofs average considerably more than 10 years. The experience of owners is that tin roofs do not last anything like 40 years. The fact is that gravel roofs are much the cheaper, even if tin roofs never had to be renewed.

CORRESPONDENCE.

Valley Rafters.

From P. W., *Branchport, N. Y.*—Answering the question proposed by "J. S. D." in a recent number of the paper, I will use ½ and ¼ inch pitch, as shown in the accompanying illustrations. Fig. 1 shows a plan of the roof to which it is supposed the rafters belong. Fig. 2 shows a section through the wall plates of the roofs, and indicates the difference in pitch between the two sets of rafters. Fig. 3 shows the angle of plates and cornices. Fig. 1 is to a scale of ¼ inch to the foot, and Figs. 2 and 3 to a scale of 1½ inches to the foot. E E in Fig. 1 and Fig. 3. indicate the outside of the plate. L M and N O show one-half of the width of each roof. The rafter at A is ½ pitch, and the rafter at B is ¼ pitch, or, in other words, it has a base of 8 feet and an altitude of 4 feet. M R in Fig. 1 is the ridge line of the roof made ¼ pitch, and O P is the ridge of the roof ½ pitch. M R will intersect the steeper roof at the point R, and this point will be 4 feet from the outside of the plate at E. Suppose the projection to be 12 inches, as shown in Fig. 2, and at F F in Fig. 1 and Fig. 3. Draw a line from R to T, Fig. 1, the latter being the angle of cornice which will give the seat of the valley rafter. It will cross the plate X L, as shown, from S to T. In Fig. 2 the rafter A is at ½ pitch and the rafter B is at ¼ pitch. In order to have cornices intersect level in angle at T it will be necessary to construct pitch of rafters A and B at T, which represents the outside of cornice, and crossing plumb-line in Fig. 2 at the points 2 and 3. In this case it will lower the plate D 6 inches. Fig. 3 shows where a valley rafter crosses the plate X E. From T, Fig. 1, to center of gable on line M R in this example is 9 feet, and from T, Fig. 1, to line Y R is 5 feet. A line drawn from R to T will cross the plate X L in the point S, which is 5.336 inches from the angle X. If the rafter B was 8 x 12 feet pitch, the plate D, Fig. 2, would be 4 inches lower than the plate C, and would cross the plumb-line at the point 7, as indicated by the dotted lines. I hope this plan will be of service to "J. S. D.," and that he will have no difficulty in understanding me.



Valley Rafters.—Fig. 1.—Part of Roof Plan Accompanying Letter from P. W.

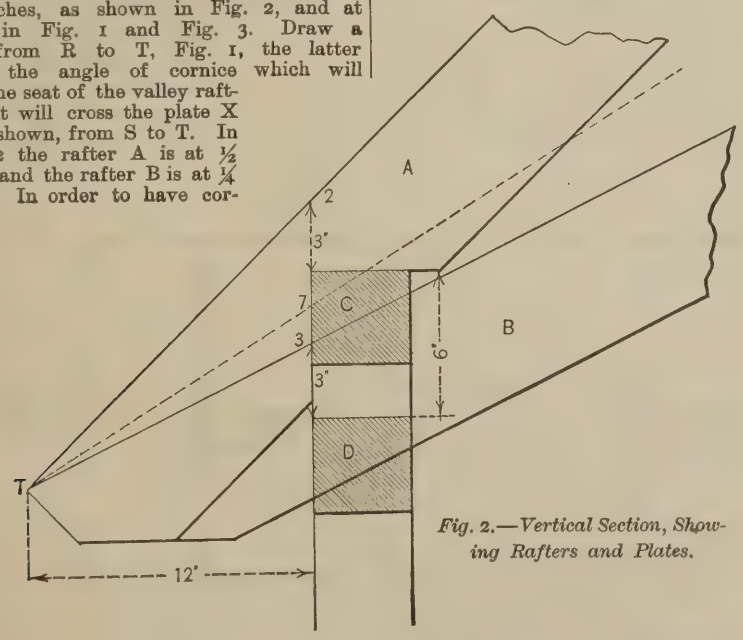


Fig. 2.—Vertical Section, Showing Rafters and Plates.

Paper Ceilings.

From E. A. L., *Cottage City, Mass.*—I notice that a correspondent from Beverly, W. Va., desires to learn the addresses of manufacturers of paper ceilings. I am now finishing rooms in a summer residence with wall or ceiling paper. The paper is cut the size of the panels. It is then wet on both sides, rolled up, closed and laid away for about 10 minutes. Then it is tacked in placed to the wall and after it is dry it proves to be perfectly smooth. The paper is finally painted and the joints are covered with gilt molding. The material costs about 15 cents per pound, and 100 pounds are sufficient to cover 2000 feet. Your correspondent can obtain the material from C. B. Bottsford & Co., 25 Hawley street, Boston.

Dry-Rot of Flooring.

From O. L., *Montreal, Canada.*—A building that I erected about three years since was located on the side of a hill. For the basement story about 3 feet of earth was excavated. The floor in the basement was made of good, sound 2-inch pine. About two years after it had been laid it proved to be dry-rotten, and I was directed to renew it. Before relaying it I took out some of the earth, so as to leave about 3 inches of air below the floor. I thought that the first floor gave out because it was laid directly on the earth. The second floor was made of good, sound timber, the same as the first. It has been in use for about seven months, but has already commenced to dry rot, as in the former case. I would like to learn what is the matter, and what would be the best means of preventing the difficulty. The soil in question is dry, composed of gravel and sand. The cedars are just as sound as when laid. It is only the flooring and lining that dry-rot as described. When I took up the first floor the part facing the ground had a sort of white moss on the under face, and the dry-rot penetrated in some cases 1½ inches in depth, leaving only ½ inch good material.

Answer.—One remedy that we would suggest to our correspondent would be excavating still deeper below the floor in question, and arranging, if possible, gratings in the walls, so that a circulation of air may be maintained under the floor. By the way in which he uses the term "cedars" above, we infer that the joists upon which the flooring is laid are of cedar. The durability of this material in various exposed and trying places is well known, and this, perhaps, accounts for the fact that it has not been attacked by the dry-rot in the same manner as the other portions. In this connection it is only proper to call our correspondent's attention to the fact that greater annoyance

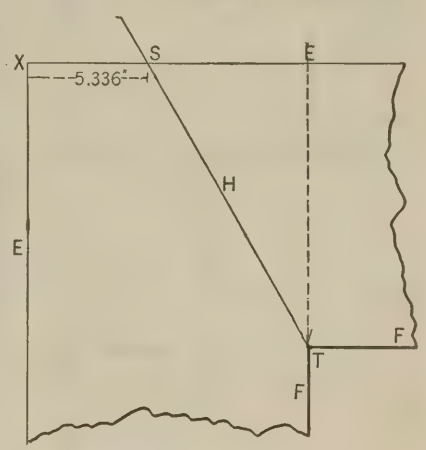


Fig. 3.—Enlarged Plan of Projection of Cornice.

or loss may grow out of the construction employed than the mere loss of the floor every few months. The presence of decayed vegetable matter and of fungus growth in such quantities as he describes below a dwelling-house would, under favoring circumstances, menace the health of the occupants. The difficulty should be overcome, therefore, not only on account of the destruction of the floors, but also as a sanitary measure. If a circulation of air cannot be obtained, we are at a loss what remedy to suggest. Thoroughly-seasoned material, creosoted or charred and covered with coal-tar on the under side, might possibly resist the action of the soil. A concrete or cement floor might be substituted. We shall welcome letters on this question from our readers, in case any of them see fit to discuss it.

County Court Houses.

From A. E. A., *Washington, N. C.*—Could you not publish, in *Carpentry and Building*, one or two designs for county court houses costing from $20,000 to $25,000? I think they would prove interesting to a great many readers.

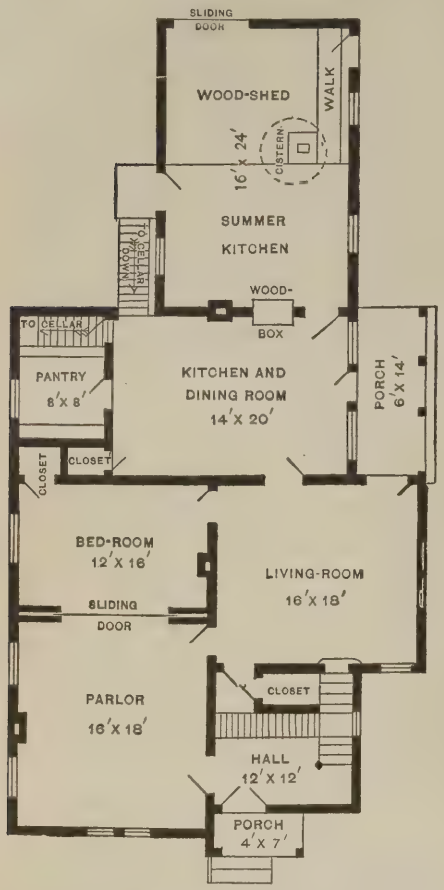
Answer.—We could no doubt comply with our correspondent's request if we thought that the best interests of our readers and of the community at large would be served thereby. When it is considered, however, that in the matter of court houses and other public buildings there are almost always some special requirements peculiar to each community in which such a building is erected, and that, in whatever way the plans may be furnished, competent superintendence is a necessity in order that public funds might be properly expended, it becomes evident that the better way is to employ a competent architect at the outset. In view of these facts we must decline undertaking the publication of designs of public buildings. Court house and jail work has become almost a specialty with certain architects, and any board of county commissioners will obtain far better results for a given sum of money by procuring plans from such an expert than by looking for

them in the columns of a building journal or by soliciting them from men who have had no special experience in the direction named.

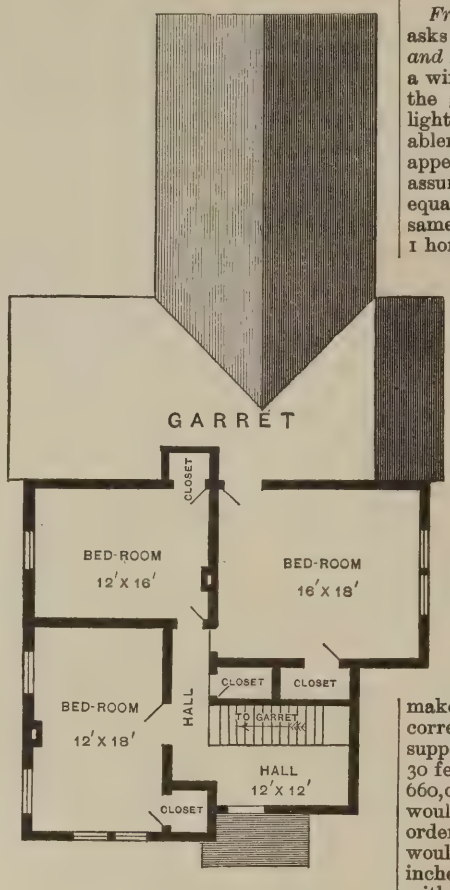
Plans for Farmhouses.

From J. M., *Belmont, Wis.*—In response to the call for plans of farmhouses, I inclose herewith first and second floor plans of a farmhouse containing all the requirements of houses of its class as usually built in this section of the country. The building presented will cost in this neighborhood $2500 or less, built under the conditions which ordinarily govern farmhouses. The building as planned is intended to face south, and to have necessary outbuildings in the rear. The summer kitchen and woodshed, as shown in the first-floor plan, are intended to be built of barn boards and left unfinished. The summer kitchen is to have a floor of rough boards, and the woodshed to be left without any floor. The back porch may be provided with a roof or not, according to the wishes of the owner. I think it would be better if built without a roof, as its presence would certainly obstruct the light in the kitchen and dining-room. In this plan an effort has been made to admit as much sunlight as possible into all the principal rooms, and to protect them, so far as may be, from the cold northwest winds peculiar to this region of the country. I would suggest that the upper panels of the hall doors and also of the outside door of living-room should be of glass.

Note.—We shall be glad to have similar studies from other sections of the country, and hope our readers who are engaged in building farmhouses will contribute, so far as possible, to the general subject under consideration. Whenever a farmhouse plan has been published which seems to give general satisfaction in its arrangement, we shall carry out the suggeston made some time since of soliciting elevations and details of construction from competent architects, thus affording the farmer the chance of a house planned according to his own interpretation of his needs or at the hands of local builders, and at the same time having a tastful exterior and one in keeping with current fashions in architecture.



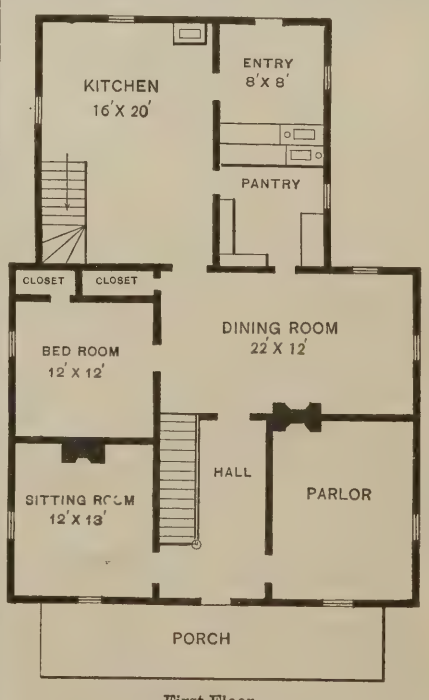
First Floor.



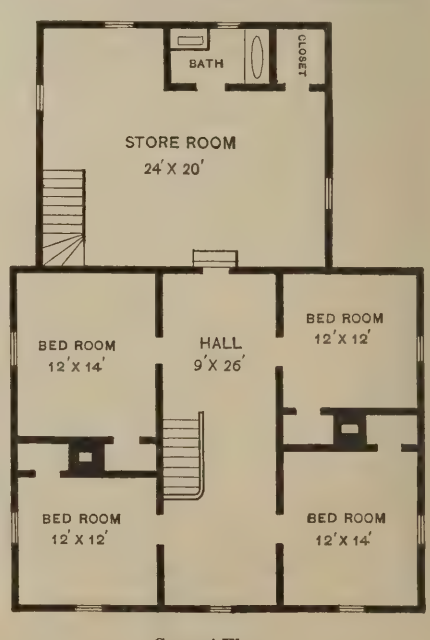
Second Floor.

Plans for Farmhouses.—Sketches Submitted by J. M.—Scale, $\frac{1}{16}$ Inch to the Foot.

From F. M. S., *Tecumseh, Nev.*—I inclose an old-fashioned farmhouse plan which I have found after years of experience to meet the wants of the majority of well-to-do farmers' families in this locality. In general terms, in order to lighten the labors of farmers' wives and daughters, a farmhouse should be made as convenient as possible. Hardwood floors should be provided in kitchen, dining-room and pantry. All the woodwork should be plain and well finished. I would heat and ventilate with the Jackson ventilating grate. For sanitary reasons, I would have no cellar under the house. A brick arched pit outside, sunk into the earth below the frost-line, and well cemented and ventilated, will answer every purpose and avoid some of the objections to which cellars are liable. The above are some of the salient points that should be borne in mind in planning and building a farmhouse, and may prove useful to some of your readers.



First Floor.



Second Floor.

Sketches Submitted by F. M. S.—Scale, $\frac{1}{16}$ Inch to the Foot.

Storing Power.

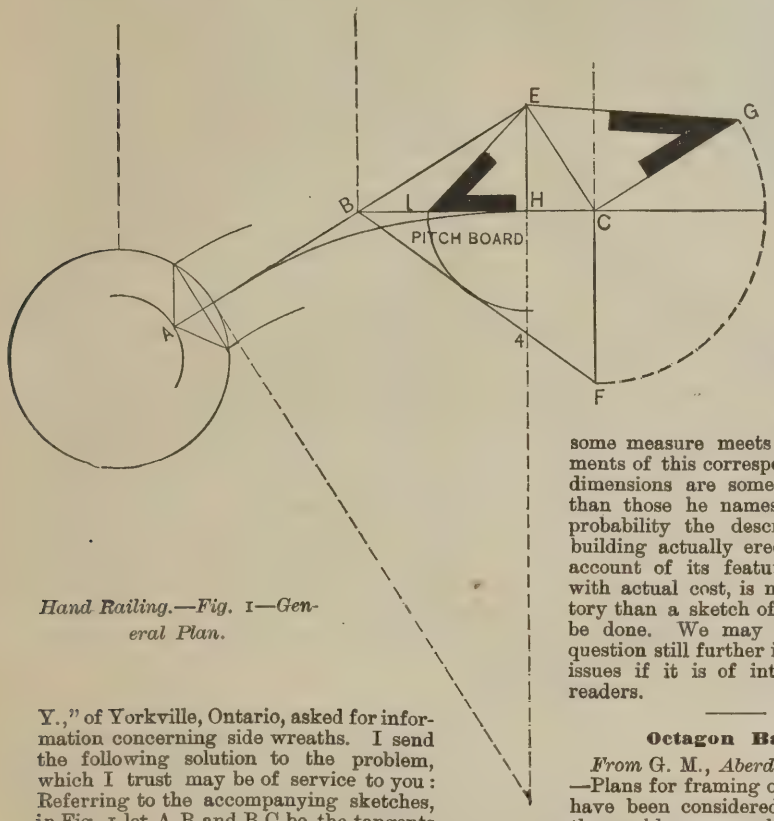
From C. E., *Henderson, Ky.*—"X. Y." asks in the January number of *Carpentry and Building* if it is not practicable to use a windmill to raise a weight, and then use the gravity of the weight so raised to run light machinery in his shop. The unreasonableness of such an expectation will readily appear from a little calculation. Let us assume that "X. Y." will need a power equal to one horse, and a continuance of the same for 10 hours. Now, the measure of 1 horse-power is 33,000 pounds raised 1 foot in 1 minute. Consequently, a weight of 33,000 pounds descending 1 foot will operate a given machine with the energy or power of one horse for only one minute. Now, in order to make this weight of 33,000 pounds operate the same for 10 hours the weight will have to be raised as many feet as there are minutes in 10 hours—*i. e.*, 600 feet. Hence it appears that if "X. Y." should use a weight of 33,000 pounds he would need to build a powerful frame scaffolding higher than the Washington Monument! The interest on the first cost of such a plant would more than pay for a new large steam engine each year, besides paying for the constant services of an engineer and fireman and all needed fuel, water, &c.

True, our friend "X. Y." could make the hight less, but then he would have to correspondingly increase the weight. Let us suppose he should determine on a hight of, say, 30 feet. The weight would then have to be 660,000 pounds! which alone, if of cast iron, would cost him about $10,000. Then, in order to suspend so enormous a weight, he would need a steel wire cable of about 5 inches in diameter. The drum at the top, with all of its connections, would have to be of corresponding strength and proportions; while the ground end of the cable would have to be attached to massive machinery of transmission, which would have to be anchored through heavy masonry deep into the earth, in order to prevent the enormous weight from pulling it up. Now, friend "X. Y.," dont you do it. Take an unknown friend's advice, and, if you have a million or so in bank that you can check on without much missing it, take a very small portion of it and buy you a small steam, gas

or petroleum engine, and give the rest to the poor. But don't waste it on a contrivance that, when completed, will only run a 1-horse power jig saw 10 hours at a time.

Hand-Railing.

From W. B. G., *Edinburgh, Ontario.*—Some time since your correspondent, "C. A. Y.," of Yorkville, Ontario, asked for information concerning side wreaths. I send the following solution to the problem, which I trust may be of service to you: Referring to the accompanying sketches, in Fig. 1 let A B and B C be the tangents to the center of the rail. A B is the level to meet the newel cap, while B C are the ground tangents of the pitch board. To find the lines necessary to draw the molding, continue the tangent line A B to E. Square from E to C. From C E square the line C G, making it in length equal to the hight C F, which is the pitch of stairs and the hight of one riser. Connect G E. In the angle E G, C will be the bevel for the joint at A. H I E will be the bevel for the joint connecting the straight rail. It is obtained by squaring from H to E. From H as center, with a radius in length touching the tangent B F, draw an arc, as shown, thus locating the point I. Connect I and E, as shown. To draw the mold proceed as shown in Fig. 2. Let A B E in Fig. 2 equal A B E in Fig. 1. From E square a line to G, making E G equal to E G, Fig. 1. Join B G and extend this line from G indefinitely, as shown. Make B 4 in Fig. 2 equal to B 4 in Fig. 1. Draw the curve 6 4 by intersecting lines, as shown. The width and thickness of stuff for the wreath is found by drawing a square section of rail, as shown in Fig. 3. Make the mold the width shown in section and parallel to center line. The thickness and width of stuff might be reduced, but in order to show the principle it is given in full.



Hand Railing.—Fig. 1—General Plan.

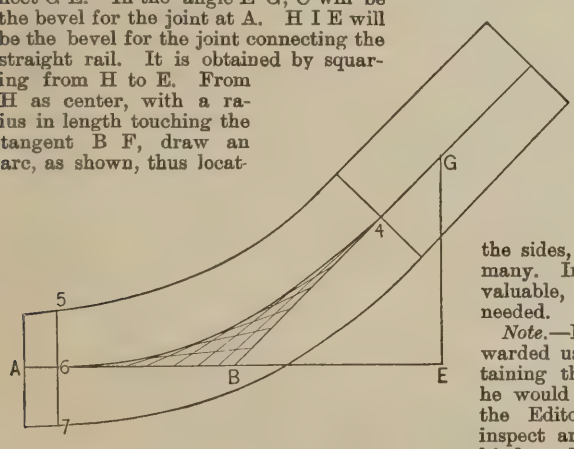


Fig. 2.—Drawing the Mold.

Roller-Skating Rinks.

From F. B. L., *Calumet, Mich.*—Now that roller-skating is all the rage, will you not give, for the benefit of your readers at large, and two of your readers in particular who contemplate erecting a rink, plans for such a building? I suggest 50 x 125 feet as the size. Also give the probable cost of the same, supposing the building to be boarded up and down and battened on the outside, and finished on the inside with common planed lumber.

Answer.—In another portion of this issue we publish plans, elevations, sections, &c., of a roller-skating rink recently constructed at Elizabeth, N. J., and which in some measure meets the requirements of this correspondent. The dimensions are somewhat greater than those he names, but in all probability the description of a building actually erected, with an account of its features, together with actual cost, is more satisfactory than a sketch of what might be done. We may refer to this question still further in subsequent issues if it is of interest to our readers.

Octagon Barns.

From G. M., *Aberdour, Ontario.*—Plans for framing octagon barns have been considered by some of the weekly papers published in this province. The authors of the plans claim that barns of this shape are stronger in both roof and frame than those of the ordinary form. They also mention among the advantages that they require no long center timbers, and have more room, according to the length of wall and expense of construction, than any other kind of frame. As usual with such papers, the drawings were badly done, and left the student much in doubt. I think the general question is one of interest to the readers of *Carpentry and Building*, and therefore I suggest that if some one who has had experience in matters of this kind would present the drawings for an octagon barn, measuring from 25 to 30 feet on the sides, he would confer a favor on many. In this neighborhood timber is valuable, and yet many large barns are needed.

Note.—If our correspondent had forwarded us copies of the local papers containing the barn designs referred to, he would have conferred a favor on the Editor. We are always glad to inspect articles of this kind, and we take this occasion to invite our readers generally to send us copies of their local papers whenever building construction or plans of any kind are up for consideration. We do not think octagon barns are in use to any great extent, although we remember years ago to have seen one or two buildings of the form of plan named. Memory does not serve us, however, as to the peculiarities of framing. We second our correspondent's suggestion, and, if any of our readers see fit to answer the question, we shall take much pleasure in engraving and publishing the plans sent.

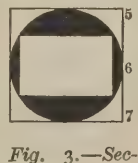
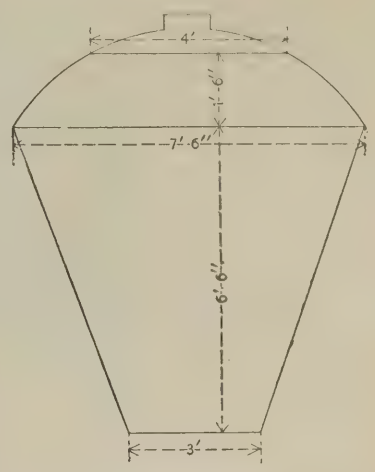


Fig. 3.—Section of Rail.

Capacity of Cistern.

From C. S. P., *Wood's Hall, Mass.*—Will some of the many readers of your valuable paper answer the following, also giving rule for the same: I have just constructed a round cistern, with an arched top or cover, of



Capacity of Cistern.—Fig. 1.—Vertical Section Through Cistern, with Dimensions.

the following dimensions: 3 feet across the bottom, 7 feet 6 inches in the widest part, and 4 feet at the outlet or overflow. The cistern is 6 feet 6 inches from widest diameter to the bottom, and 1 foot 6 inches from widest diameter to the overflow, or, in other words, the cistern is 8 feet deep. What is the capacity of the cistern in barrels of 31½ gallons? Quite a number have figured out

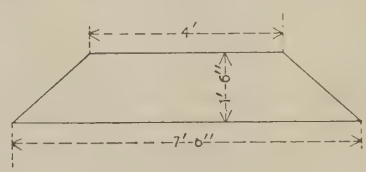


Fig. 2.—The Upper Part Considered as the Frustum of a Cone.

the above, and no two have agreed. An early reply would meet the appreciation of a subscriber.

Answer.—The difficulty our correspondent has met in finding the exact capacity of his cistern is probably due to the form of the top, which he describes as "arched." The term arched is of very wide significance, and its vertical section may include every curve from one varying but little from a right line to an arc of a circle of small radius. In the first instance, the capacity of the upper part of the cistern could be calculated with but very small error by assuming it to be a frustum of a cone; in the second instance, a tedius calculation would have to be gone through to obtain even an approximate

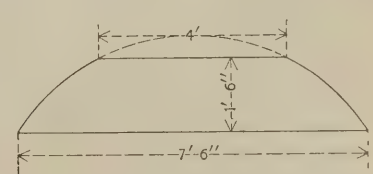
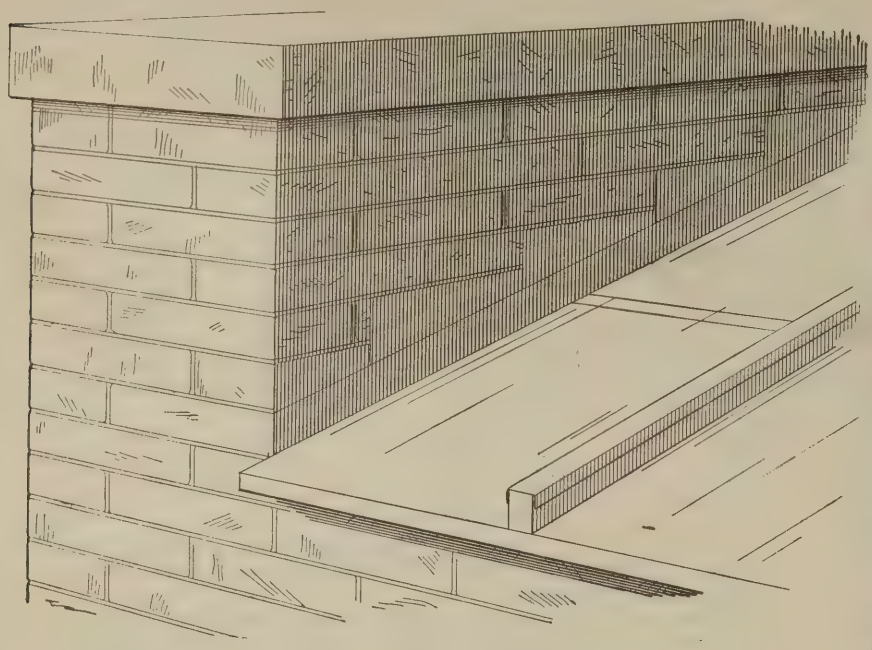


Fig. 3.—The Upper Part Considered Spherical.

result. In our treatment of the problem we have given two solutions—one in which the top of the cistern is taken to be the frustum of a cone, and a second in which the arch is assumed to be spherical.

Referring to Fig. 1, which presents a vertical section of the cistern through the center, we see the lower part of the cistern is the inverted frustum of a cone whose volume may be found by the following rule: Add together the squares of the diameters of the greater and lesser ends and the product of the two diameters; multiply their sum by

.7854, and this product by the hight; then divide this last product by 3. Applying this rule we find the capacity to be 258032 .1744 cubic inches. In Fig. 2 we give a



Copper Roofing.—Fig. 1.—General View of Roof and Flashing Against Fire Wall.

section of the upper part of the cistern considered as the frustum of a cone, its capacity figured by the same rule is 69385.3776, which, adding to the above and reducing to gallons of 231 cubic inches, and then to barrels of 31½ gallons, gives 44.99+ barrels. Assuming the arched roof to be spherical, the section of which is shown in Fig. 3, the capacity of the upper part of the cistern will be that of a spherical zone. The following rule is to be applied: To the sum of the squares of the radii of the two ends add ⅓ of the square of the hight of the zone; multiply this sum by the hight and again by 1.5708. By this rule we find the volume to be 76595.3496 cubic inches, which, added to the volume of the lower part of the cistern, and reduced to barrels as above, gives 45.98+ barrels.

Construction of Copper Roofs.

From Jno. G. Hetzel & Son, *Baltimore.*—We take pleasure in submitting to the readers of *Carpentry and Building* some facts con-

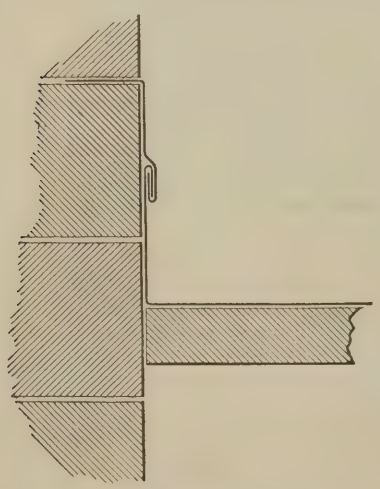


Fig. 2.—Section Through Flashing.

cerning copper roofing and our mode of constructing copper roofs. The latter we have found to answer in all cases, and it fully overcomes the difficulties of contraction and expansion. The plan submitted was used on the Peabody Institute, and also on the Johns Hopkins Hospital, with entire satisfaction. The roof of the Peabody Institute has been in place about 30 years, and that on the Johns Hopkins Hospital for five years. As yet we have never been called upon to repair either of them. We do not recommend copper for gutters or valleys, because, on account of the construction necessary to be employed, there is very little room, if any, to provide for contraction and expansion. We prefer to use IX or IXX tin plate of the best quality, well soldered and painted on the under side, and also on the top, before the slate or shingles are put in place. Of course, where a copper roof is used we are compelled to use copper gutters; the water running from a copper roof would corrode the tin. In laying copper gutters we would not hook the cross-seams or joints. We would tin one side of the under sheet and both sides of the upper sheet—that is, we tin them at the joint, say, 1½ inches. Then we rivet the sheets together with copper rivets, used ¾ inch apart, and then solder, using the very best solder, and applying with heavy irons, so as to soak the solder through and through. We use 16-ounce copper, in sheets 24 inches wide and 60 inches long, in our roof construction. For gutters we use 16-ounce copper, of widths to suit the required construction and 96 inches long, to avoid making any more seams than necessary.

With reference to the use of light copper we would say that we have taken out gutters of 12-ounce copper, which have only been in place a few years, and which in that time have buckled and cracked into holes. At present prices of copper we would charge $25 per square for a roof put on as below described and illustrated. In the measurements we take in all surfaces shown, including grooves and flashings, and also add 1 foot extra for all hips or miters. With reference to the material for roofing, we prefer a good quality of tin plate to copper. We would use 14 x 20 sheets, well painted on the under side, and dried before laying. A roof of this kind costs only about one-third as much as copper. Tin roofs laid of the material above suggested which the senior member of our firm put in place 38 years ago are in good condition in this city to-day. In that time they have required scarcely any repairs.

Referring to the inclosed drawings, it will be noticed by Figs. 1 and 2 that at the wall we turn an edge about 2 inches high with a hook into which the flashing is hooked. This construction successfully avoids an accumulation of dirt and also the necessity of soldering at a place where breaks would be very liable to occur in case the flashing was soldered to the roof. In laying the roof, we cleat, as illustrated in Fig. 3, about 12 inches apart. This done, the wooden strip is nailed in place, as shown by Fig. 7. This is made to cover the first cleats put in position. A second course of cleats is then nailed in place on the opposite side of the strip, as shown in Fig. 4, after which the next course of copper is put in place, illustrated in Figs. 4 and 5. The cleats are then turned over the first sheet, as shown in Fig. 7. Then, by the use of ⅜-inch roofing tongs, we turn both roofing copper and cleat over, as shown on both sides of the strip of wood in Fig. 5. When two courses have been put in place the work is ready for the cap, which is formed in shape as shown in Fig. 9. This is formed in sections about 48 inches long. One edge is hooked over and the other afterward bent in position, as shown at Fig. 10. It is then flat-

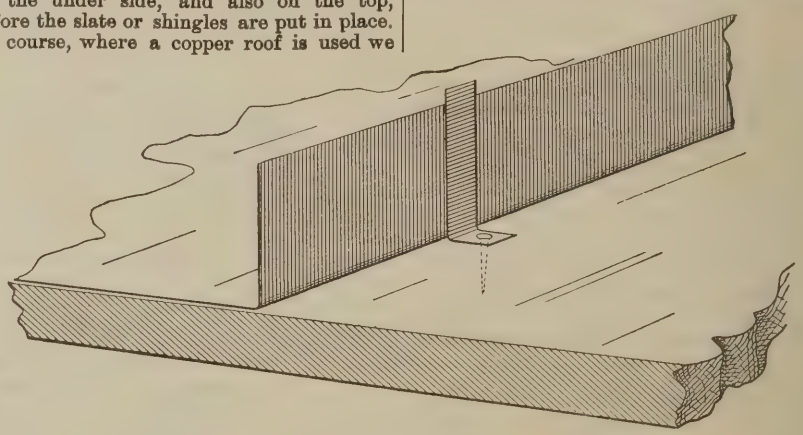


Fig. 3.—Manner of Cleating One Side of the Roofing Sheets.

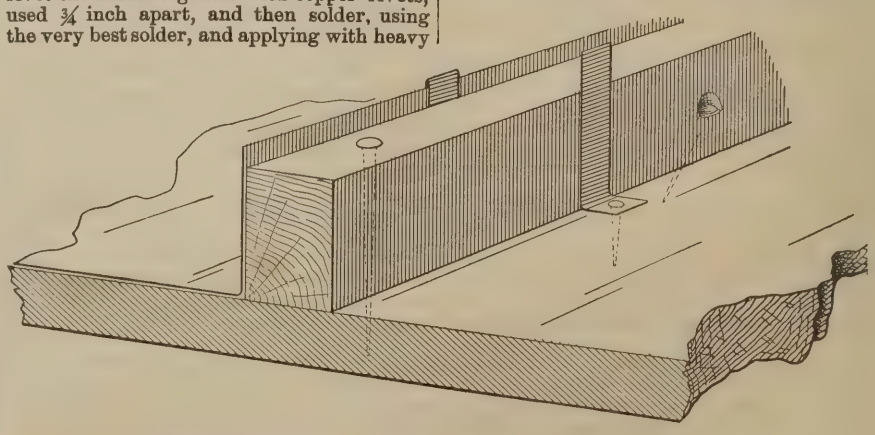


Fig. 4.—Manner of Applying the Second Course of Cleats.

tened down against the side at the wooden strip, as shown at Fig. 8. Cross-beams in the strips of copper for the roof are formed as shown at Fig. 11. We do not allow the hooks to touch, neither do we solder the

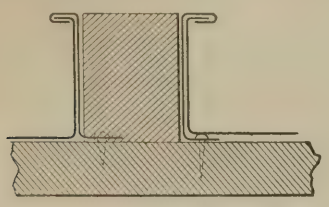


Fig. 5.—The Second Course of Copper in Place, and Both Cleats Turned and Edges Bent to Receive Cap.

joints. The cross-joints of the caps we lap about 1½ inches, or more if the roof has very little pitch, and leave them without soldering. With reference to tinning copper for roofing purposes, we would say that we do not think it necessary to tin the copper on either side, unless it is desired to save the water from the roof for use.

Discussion of Old Problems.

From J. R. L., *Chillicothe, Mo.*—I noticed in the November number of *Carpentry and Building* of last year one or two problems called up which have already been discussed at several different times since the journal was established. The fact that space is being occupied by the discussion of old

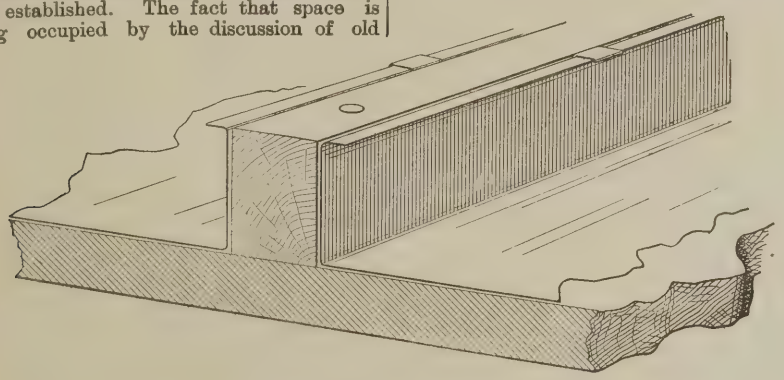


Fig. 6.—Perspective View of the Work, as Shown in Section in the Previous Cut.

problems causes me to make this suggestion—that when a new subscriber enters upon the list he should at at once purchase the back volumes, so as to have the benefit of all that has been published. It is unnecessary for me to inform the older readers that back volumes can be obtained in loose numbers—and, better still, bound—at very reasonable figures. I know of no way for young men to obtain so much information at so reasonable a price. I have been a subscriber to the paper since it was first issued, and at the end of each year I have had my numbers bound, and the volumes now accumulated constitute a veritable library. If all the new subscribers would pursue this plan it would not only benefit them and result in their securing at once a valuable set of

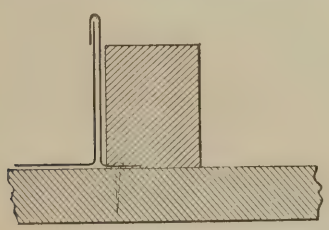


Fig. 7.—Wooden Strip Over Which Seams Are Made, Put in Place After Cleats Have Been Applied.

books relating to their trade, but would obviate the necessity of asking and answering the same questions so many times. I make this suggestion for the benefit of the Publisher and the Editor as well as for the readers of *Carpentry and Building* who have saved their numbers from the commencement.

Note —Our correspondent's suggestion has no doubt been offered with the best intent, and, since a portion of it has been prompted by a consideration of the interests of the publisher and the convenience of the Editor, a few words with reference to it are appropriate. While in the main it is not desirable to repeat old questions or to republish what our old subscribers have already become familiar with, this correspondent and others will bear us out in the assertion that in almost every instance where a new subscriber has called up an old question he has also called out new answers, which have been of great interest to all. In our correspondent's letter, only a portion of which we publish above, he cites particularly the questions of hip rafters and kerfing, which received attention some time past and which have been recently revived. We think our readers will agree with us that, in the latter case particularly, some of the answers which we have recently published are far more valuable than those to be found in the back volumes. The Editor uses his discretion in the publication of inquiries, and in many instances writes personal letters to his correspondents, calling attention to solutions of

Fig. 9.—The Cap Ready to Apply.

the question proposed which have already been published. In this way many inquiries are satisfactorily answered which never see the light of our pages. Those which are allowed to be printed are published from time to time solely for the purpose of giving willing men among our readers the opportunity of contributing to the general fund of intelligence of which *Carpentry and Building* is becoming the treasure vault. We appreciate the high words of praise which this correspondent utters with reference to this journal, and we hope to so manage it that in years to come it may be just as highly prized by its subscribers as at the present time.

Thirteenth Competition.

From R. R. J., *Olyphant, Pa.*—I have commenced building for myself a house according to the design submitted by Mr. S. A. Bishop in the Thirteenth Competition. I have made some very slight variations in the details. I have given the various designs published in *Carpentry and Building* very careful attention, and have concluded that the one by Mr. Bishop is the best adapted to a workingman with a small family. In passing through Scranton, Pa., a short time since my attention was called to a house built according to this plan, and with a bay window on the left side. The house

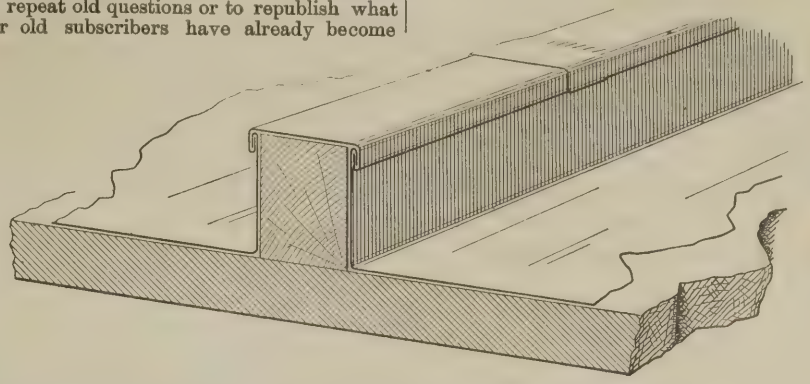


Fig. 8.—The Seam or Roll Finished by Flattening the Cap Down Against the Sides.

has been painted in appropriate colors, and is very attractive in its general appearance.

Architects' Plans.

From ARCHITECT, *New York City.*—I am an architect by profession, and would like to have your opinion on a question which comes up in the course of my business. I made an arrangement some time since with a builder to prepare designs and specifications for a large uptown building, for which service I was to receive $600. I submitted the plans for his inspection, and after keeping them four or five days he returned them to me, desiring certain alterations to be made. I made these changes and again delivered the plans to him. He refused to receive them, however, saying that the drawings were of no value to him, because they were incorrect. From marks on the drawings, and from information received, I have every reason to believe that the builder had copies taken of the drawings by the blueprint process Now, what I would like to know is this: Can I recover anything, admitting that there were at first some inaccuracies and these were corrected afterward. The builder is about to go on and erect the building to my designs.

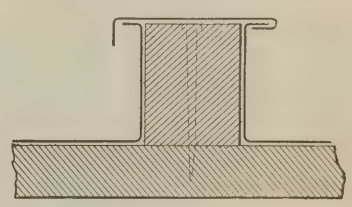


Fig. 10.—The Cap as Slipped in Place.

Answer.—The question of our correspondent's ability to recover for the work he has done turns on the nature of the contract or understanding at the time he prepared the drawings. If he can prove an order from the builder for the work, and if he can show that the work was intelligently performed, and was not so defective as to be useless, we should think he had a very clear case, and that any court of competent jurisdiction would decide in his favor. If blue prints were taken from the drawings mentioned they were taken before the corrections were made, which would seem to prove that those corrections were not vital to the plans. It is possible that the order for the corrections was of the nature of a quibble upon the part of the contractor, and was made simply to further his plan of obtaining the drawings without paying for them. Should our correspondent decide to go into court in this

Fig. 11.—Cross-Seams in the Strips of Copper for Roof.

matter, if he can obtain one of the blue prints made from his drawings, and can prove, in addition, that the building is really being erected to his plans, he will still further improve his chances of success. It is no uncommon thing for builders to attempt to obtain the use of architects' talent, or at least to try to in ways similar to this, and many cases have been tried and decided which thoroughly establish the claim for pay for work ordered and actually performed, no matter what may have been the use to which the drawings were afterward put. Copying the drawings and building to the copy is the same as building to the original drawings.

REFERRED TO OUR READERS.

Ropes and Pulleys.

From G. F., *York, Pa.*—I have a question that I desire to refer to the practical readers of *Carpentry and Building* for discussion. Is there more strain or weight on a derrick when raising a given number of pounds with a single rope than when the same work is undertaken with a double block and tackle? It seems to me there is room for two opinions.

Country Road Bridges.

From G. H. B., *Virden, Manitoba.*—It would be a great favor to some of your subscribers living on the fronter if readers of *Carpentry and Building* would contribute designs and specifications of country road bridges. Estimates of cost and bills of material would also be desirable.

Laying Off Sash and Doors.

From W. J. R., *Omaha, Neb.*—If some practical reader of *Carpentry and Building* will give us some quick method of laying off sashes, doors, blinds, &c., he will confer a great favor. I am in a mill and would like to have explained some quick method for doing work of this kind.

Wigwam Framing.

From F. B. L., *Calumet, Mich.*—I have heard of "wigwams" being built of flooring, with an arched roof, using four or five thicknesses for the arches of the roof. Do any of the readers of *Carpentry and Building* know of such a building? If so, they will confer a favor upon a fellow-subscriber by giving some account of its construction. The idea is to get the largest surface inclosed for the least amount of money consistent with safety.

Box Construction.

From G. A. S., *Adowa, Ark.*—In making boxes and other work out of lumber, should the nails go clear through or not? Which is the strongest, a nail that does not go entirely through, or one that projects somewhat through, the piece against which the outer piece is nailed?

Note.—This question, which is in a little different form from anything we have before seen presented, is worthy of consideration. We shall be glad to have opinions and letters of experience from our readers.

TRADE NOTES.

Messrs. Clem & Morse, of Nos. 411 and 413 Cherry street, Philadelphia, have purchased the property at Frankford road and Wildy street formerly occupied by Martin Landenburger as a shawl factory, and will use it as an elevator manufactory. The lot has a frontage of 50 feet on Frankford road and extends back about 360 feet to Shackamaxon street, with a frontage there of 60 feet. In addition to the 4-story building, 50 x 251, including engine, boiler-house and stables, which is being fitted with the necessary shafting and machinery, the firm will erect a 1-story factory, 98 x 60, fronting on Shackamaxon street. The works will be moved from the present stand on Cherry street as soon as the new building can be got ready, but they will still keep their down town office at the old stand on Cherry street. The price paid for the lot and factory was $40,000.

The Hartshill Brick and Tile Company, Hartshill, Stoke-on-Trent, England, have favored us with copies of their circulars and catalogues describing blue, red and buff floor tiles, blue, red and brown roofing and ridge tiles, garden border tiles and various kinds of terra-metallic goods. The catalogues are handsomely printed in the several colors mentioned, and show a very extensive line of designs in a very satisfactory manner. The catalogues are of exceptional value to architects and designers.

The fire which destroyed the works of the Bodine Roofing Company, Mansfield, Ohio, a short time since, demonstrated in a marked manner the fire-proof qualities of the roofing which they manufacture, and with which the frame buildings used in carrying on the business were roofed. The buildings were of the ordinary frame construction peculiar to cheaply-built factories, and when the fire once started it was a foregone conclusion that all would be destroyed The fire originated in the inside of the buildings, and before the fire department could get on the ground was beyond control. A small part of one of the roofs was not burned. On this piece of roofing the sheeting and rafters were almost entirely burned from the under side, but the covering was preserved intact and was only charred through in occasional places. The company state that they and all who have seen the part of the roof referred to regard it as a very remarkable demonstration of the ability of this form of roofing to resist fire.

We have received from W. Harbrow, London, his illustrated circular of iron churches, dwellings and other structures. These buildings are composed of an inside framing of yellow pine, and are finished on the outside with galvanized corrugated iron. They are intended for export, and particularly for use in the British colonies. Considerable taste has been displayed in the designs, and very creditable buildings are offered at quite reasonable prices. The parts of these buildings are fitted and marked in the most simple manner, and suitable drawings are supplied for the guidance of the workmen who put them up.

The Durham House Drainage Company, with offices at 231–235 East Forty-second Street, New York, have recently issued a special circular to the trade, from which we make the following extract: "Heretofore it has been the policy of this company to reserve control of construction of all work. We have refused to sell our pipe and fittings outright for fear that they would be put together improperly, and discredit thus be brought upon the Durham system. The expense attendant upon sending workmen to distant points has deterred many from adopting this system, and we have had so many requests for the privilege of buying the materials only that we have decided to fill all such orders in future. Recent improvements enable us to ship complete systems, ready to be screwed together, so that the risk of poor workmanship in construction is reduced to a minimum. It is only necessary for the owner to see that the plumber or steam-fitter who does the work shall use a thick paste of red lead on the threads, and Robbin's chain tongs for screwing up the pipe. Full instructions on all points can be found in our pamphlet on 'House Drainage,' but it will be found impossible to go wrong if the above conditions are insisted upon. On receipt of rough sketch showing about what is wanted, we will quote price for the complete work, with all pipes cut to exact measure, and threaded and ready to be screwed together. Drainage plans revised gratis for customers. Orders can be shipped on day following receipt. Complete plans furnished with each system. By extending our field of operations we are enabled to make the price of the Durham system literally 'within the reach of all.'"

Charles D. Phillips, of Newport, Monmouthshire, England, has favored us with copies of his circulars describing his single-grip and double-grip lock-jaw roofing tile and other goods of his manufacture. These tile have the merit of forming a valley without the use of special shapes. The manufacturer also calls attention to the fact that skilled labor is not necessary for laying them.

The Smith & Anthony Stove Company, of Boston, send us a copy of a new edition of their little work entitled "Our Homes. How to Heat and Ventilate Them.' This is a charming little work, containing an entirely new line of illustrations, all of which are well made and well printed. The text is a compilation from various recognized authorities on hygiene, interspersed with illustrations and descriptions of the heating apparatus made by the firm, and concluding with many pages of enthusiastic testimonials from those who have used the "Anthony Wrought-Iron Furnace," which has since been improved in the "Anthony Steel-Plate Furnace."

One of the special patterns of roofing tiles being laid on buildings in Great Britain at the present time is known as the Broomhall patent tile. It is a modified form of what have heretofore been known as pan tile, with special provision for fastening and locking. It is manufactured by the Broomhall Tile and Brick Company, Limited, London. We have recently been favored by the manufacturers with circulars of these goods, which present a very satisfactory description of them.

The subject of ventilation receives more scientific consideration in England perhaps than in in this country. Certain it is that systems of ventilation devised by eminent engineers are there more largely advertised than with us. We have recently received from E. H. Shorland, Manchester, England, a considerable collection of circulars describing the patent Manchester grate and vertical ventilating-pipe. The system of ventilation seems to possess merits, and is worth the consideration of architects generally.

The Broseley Tileries Company, Limited, Broseley, England, have issued a very handsome illuminated circular showing their floor tile, and a circular in common print showing their roof tile, roof cresting, &c. The former contains some of the handsomest designs we have recently inspected, unusually well printed in colors. Both circulars are very acceptable additions to our collection of trade publications.

The illustrated price list of goods manufactured by the Aylesford Pottery Company, Aylesford, Kent, England, is a quarto pamphlet of some 50 pages, handsomely done in colors. Among the goods shown are patent machine made and pressed roofing tiles in red and plum-color, and ridge tiles and finials to match. The assortment of finials is unusually large, and some very excellent designs are presented. Vases, chimney-pots and other goods are also shown in the catalogue.

The Miller Lock Company, of Philadelphia, have recently hit upon a very neat method of keeping their name and address prominently before the public. They have produced a very neat form of pocket screwdriver, suitable for carrying upon a key-ring. It is nickel-plated, and on one side bears the name and address of the company, with brief mention of the goods manufactured. It is sent out in a small envelope, "With the Compliments of the Lock Company." We acknowledge receipt of one of these trinkets, and expect to find it a very useful addition to our collection of pocket hardware.

Rain-water cut offs are coming into very general use in this country, but we do not know that any one is making an automatic cut-off which first allows the roof to be rinsed, throwing that portion of the rain water into the waste-pipe, and afterward automatically turning, so as to throw the remainder into the cistern. Such devices are in use abroad, and recently we have received circulars from C. G. Roberts, Haslemere, England, describing a rain-water separator of this general character. This device has been pronounced by the English architectural journals as a very clever contrivance.

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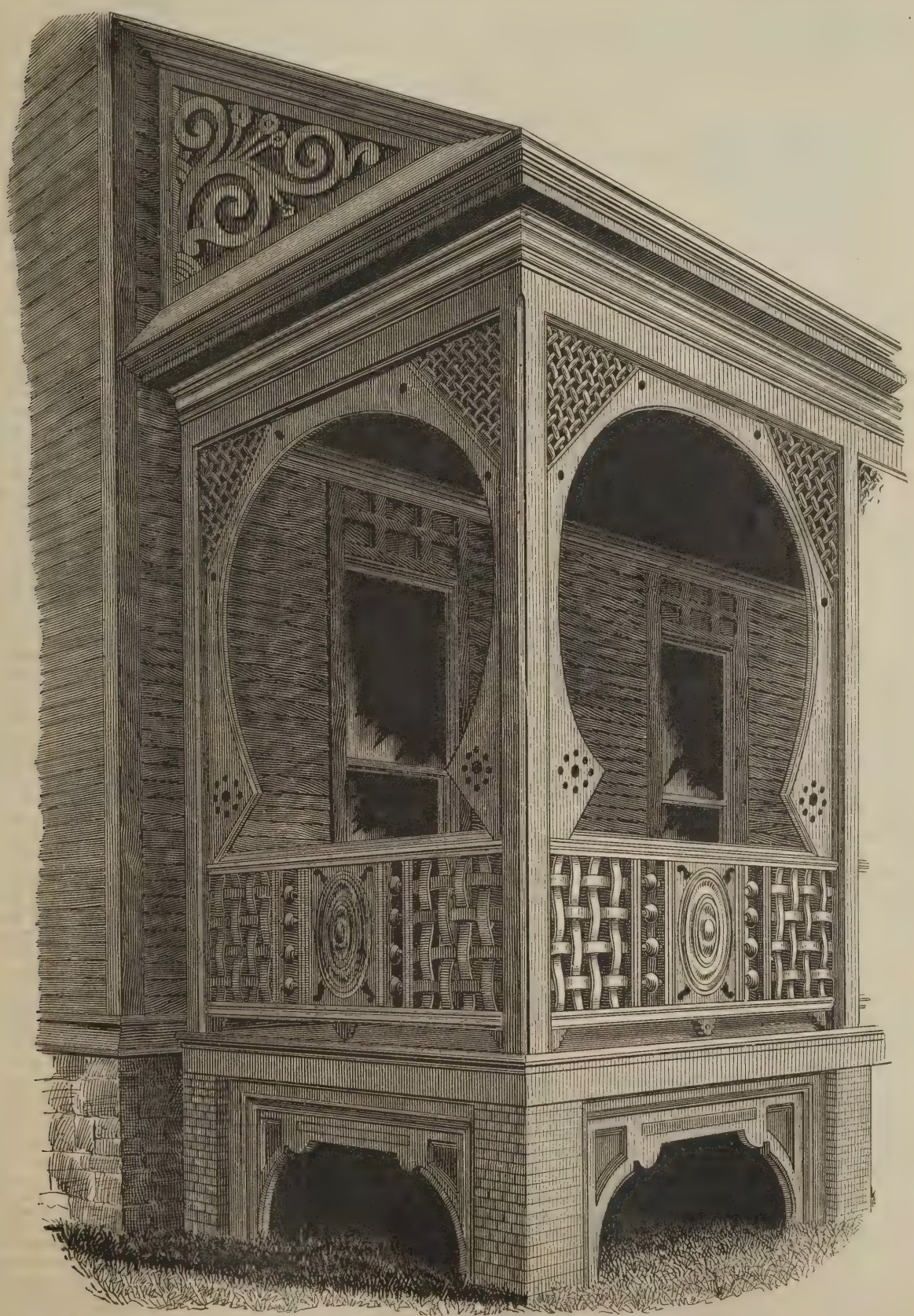
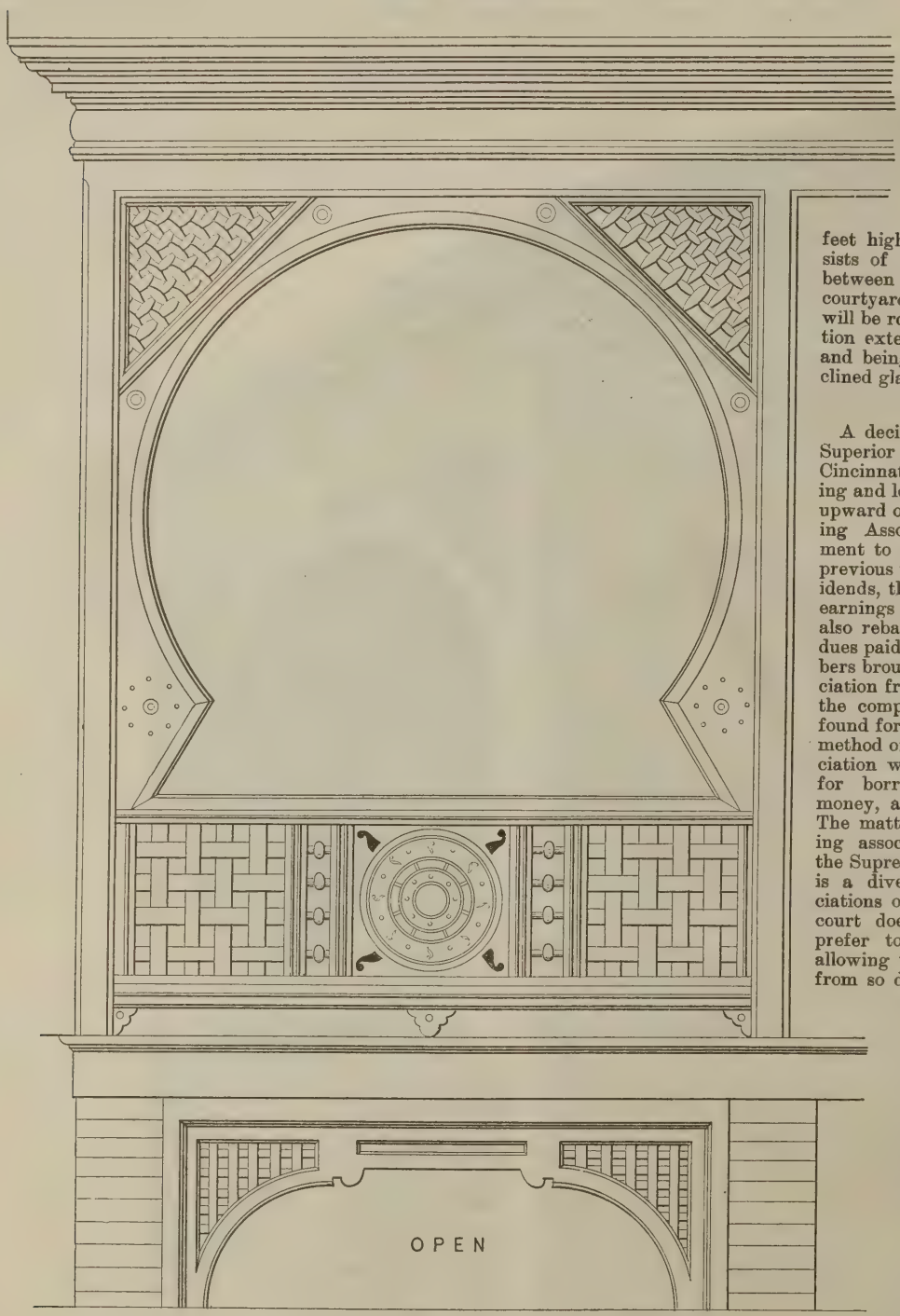


DESIGN FOR VERANDA.—J. R. CHURCH, ARCHITECT, ROCHESTER, N. Y.

Veranda Design.

In the perspective on our first page and the elevation and details on this and the next page, Mr. J. R. Church, of Rochester, N. Y., has laid before our readers a study in the design and construction of verandas applicable to modern houses that cannot fail to be both interesting and valuable in various directions. The design is in many respects a radical departure from the conventional forms that have been in common use for work of this kind for many years past, and the parts and construction are of such a character as to permit of convenient working without entailing any unreasonable cost. The elevations and details so clearly show the designer's intentions that extended description is unnecessary.



Veranda Design.—Front Elevation.—Scale, ½ Inch to the Foot.

German technical papers recommend the following mixture for the staining of wood in imitation of cedar: Two hundred parts of catechu, 100 parts of caustic potash, and 10,000 parts of water, all by weight. The longer the wood remains in this solution the better the stain penetrates its fibers, and thick veneers can in this way be stained right through the whole thickness, which permits a refinishing without injury to the color.

NOTES AND COMMENTS.

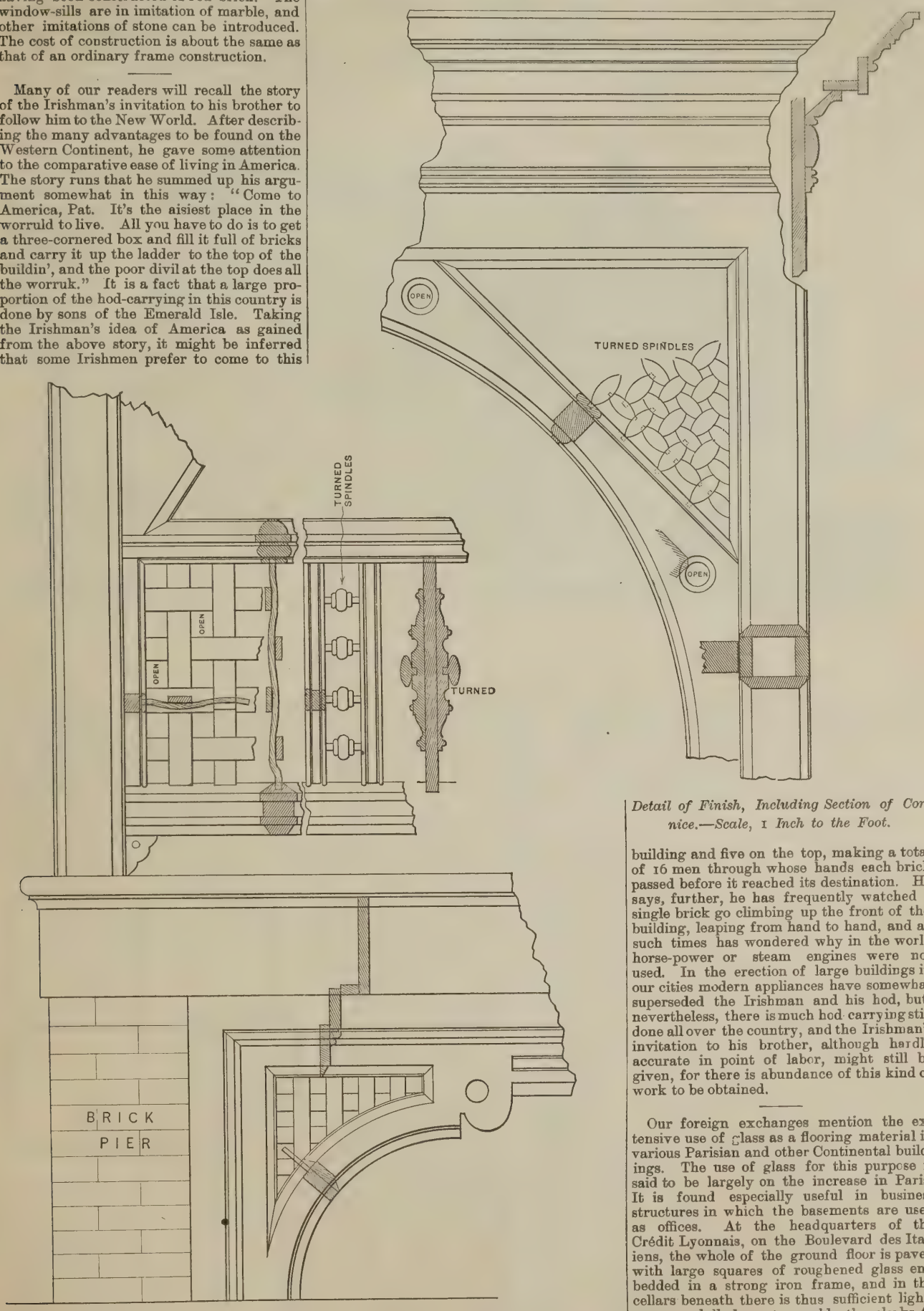
The new Pension Building, Washington, which is nearing completion, and in which the inauguration ball is to be held under a temporary roof covering, is, judging from the engravings that have appeared in some of the illustrated papers, about as handsome as a Quaker meeting-house or a modern barn. It is said to be modeled after some of the great Italian palaces. It has the merits of severe plainness and abundant light, judging at least from the number of windows, and thorough construction. It shows in every portion that it is the work of an engineer rather than of an experienced architect—that is, features of construction and general utility have been considered of prime importance, while design and decoration have been held secondary. The building is said to be the first of the kind ever attempted in this country. The leading idea is a large hall fully lighted and ventilated from the outside and surrounded by rooms. This arrangement is said to do away with the dark, unwholesome halls that are found in nearly all the public buildings of the country, and avoids small and badly-ventilated rooms, which have such a deleterious effect upon the health of Government employees. The roof is to be of iron and fireproof. The foundation of the building is of concrete resting on the natural ground. The building will have 166,000 square feet of flooring. The outer walls are faced with pressed brick, laid with red mortar, and decorated with moldings and sculptured in terra-cotta. The window cornices and the general architectural design of the building is described as Roman, and it represents some of the features of the works of the Renaissance architects of the Roman palaces and villas. The windows are decorated with pilasters, cornices and pediments in the two upper stories, while in the lower story they are provided with horizontal cornices supported by terra-cotta consoles. An idea of the building will be gained from the statement that it is a structure 42 feet wide, covering the outside of a rectangular space 400 feet long by 200 feet wide. The building is 75 feet high, and, as already mentioned, consists of three stories. The interior space between the walls forms a large covered courtyard or inside hall. The courtyard will be roofed, the vertical sides of this portion extending above the building proper and being of glass. No horizontal or inclined glass lights are used.

A decision recently handed down by the Superior Court, sitting in General Term at Cincinnati, is of much interest to the building and loan associations, of which there are upward of 300 in that city. Victoria Building Association No. 2 adopted an amendment to their constitution terminating the previous practice of allowing borrowers dividends, the same as non-borrowers, from the earnings of the association for the year, and also rebates of interest on the amount of dues paid in during the year. Certain members brought an action to restrain the association from thus changing their rule as to the computation of dividends. The court found for the association, holding that the old method of dividing the earnings of the association was in effect allowing two credits for borrowing members for one sum of money, and hence an unsound practice. The matter is of such vital interest to building associations that it will be carried to the Supreme Court. In the meantime there is a diversity of practice among the associations on this point. The decision of the court does not prevent associations which prefer to favor borrowing members, by allowing them both dividends and rebates, from so doing. Borrowers, will, of course, now seek that class of associations, and it is maintained on the one hand that non-borrowing members will be compelled to follow the borrowers, because associations without borrowers cannot pay dividends; and, on the other hand, that associations thus favoring borrowers are acting on a principle that will speedily ruin them.

We had hoped that the day of cheap chromos, whether the term be applied to imitation oil paintings or to other imitations of genuine articles, was past, but it seems that a desire to possess something which shall appear for something more than its worth is still in existence. An exchange devotes attention to imitation brick houses. We do not know of anything much more absurd in architecture than imitating brick or stone by wooden construction. The following description of how such houses are built may or may not be of interest to our readers: The process consists in the adaptation of well-seasoned grooved and tongued flooring boards, with the bead and grooves cut in the boards, forming panels of regular brick size, fastened to the frame of the building with blind nails. The grooves are filled with white lead before being nailed on the house, and represent the striping between the brick. After the weather boarding is pu

on it presents a smooth surface like a floor, and a printer's roller is used in applying a paint made of Venetian red, instead of ink, giving the side of a house the appearance of having been constructed of red brick. The window-sills are in imitation of marble, and other imitations of stone can be introduced. The cost of construction is about the same as that of an ordinary frame construction.

Many of our readers will recall the story of the Irishman's invitation to his brother to follow him to the New World. After describing the many advantages to be found on the Western Continent, he gave some attention to the comparative ease of living in America. The story runs that he summed up his argument somewhat in this way: "Come to America, Pat. It's the aisiest place in the worruld to live. All you have to do is to get a three-cornered box and fill it full of bricks and carry it up the ladder to the top of the buildin', and the poor divil at the top does all the worruk." It is a fact that a large proportion of the hod-carrying in this country is done by sons of the Emerald Isle. Taking the Irishman's idea of America as gained from the above story, it might be inferred that some Irishmen prefer to come to this country, rather than to go elsewhere, because there is hod-carrying to be done here, while there is none of that kind of labor to be done in other sections that might be named. In Germany, for example there are no hod-carriers. A hod is said to be as unknown in that country as an Irishman. Instead of carrying the brick from the ground to the place they are to be used, in the manner common in this country, they are passed from hand to hand upward. The higher up the bricklayers are, the more men are required to toss the brick. The average is about two men to a story, with enough more to lead from the front of the building to the place where the bricks are needed. A correspondent writing from Europe says that he has seen three men on the ground, eight on the front of the building and five on the top, making a total of 16 men through whose hands each brick passed before it reached its destination. He says, further, he has frequently watched a single brick go climbing up the front of the building, leaping from hand to hand, and at such times has wondered why in the world horse-power or steam engines were not used. In the erection of large buildings in our cities modern appliances have somewhat superseded the Irishman and his hod, but, nevertheless, there is much hod-carrying still done all over the country, and the Irishman's invitation to his brother, although hardly accurate in point of labor, might still be given, for there is abundance of this kind of work to be obtained.



Veranda Design.—Detail of Railing, &c.—Scale, 1 Inch to the Foot.

Detail of Finish, Including Section of Cornice.—Scale, 1 Inch to the Foot.

Our foreign exchanges mention the extensive use of glass as a flooring material in various Parisian and other Continental buildings. The use of glass for this purpose is said to be largely on the increase in Paris. It is found especially useful in business structures in which the basements are used as offices. At the headquarters of the Crédit Lyonnais, on the Boulevard des Italiens, the whole of the ground floor is paved with large squares of roughened glass embedded in a strong iron frame, and in the cellars beneath there is thus sufficient light, even on dull days, to enable the clerks to work without gas. The large central hall at the offices of the Comptoir d'Escompt has also been provided with this kind of flooring, and it is said that, although its prime cost is considerably greater than that of boards, glass is in the long run far cheaper, owing to its almost unlimited durability.

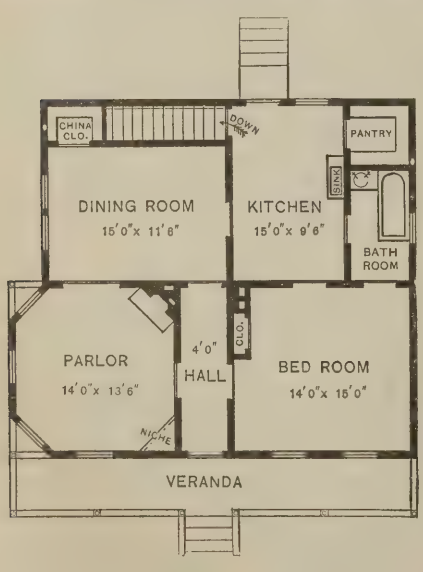
A One Story Cottage.

We present herewith perspective, elevations and details of a one-story cottage, designed by S. C. King, architect, 1011 Woodland avenue, Des Moines, Iowa. The estimated cost of the structure by the author is between $800 and $1000, depending somewhat upon the character of the finish, the quality of the materials used and the section of country in which it is erected. There is an element of convenience about the arrangement of the rooms which will be appreciated by our readers. The house is free from some of the expensive features which are often objected to in cheap cottages, and is one that is well adapted to working people and others of moderate means who desire to own their own homes.

COTTAGE DESIGN BY S. C. KING, DES MOINES, IOWA.

Improvements in Window Sash.

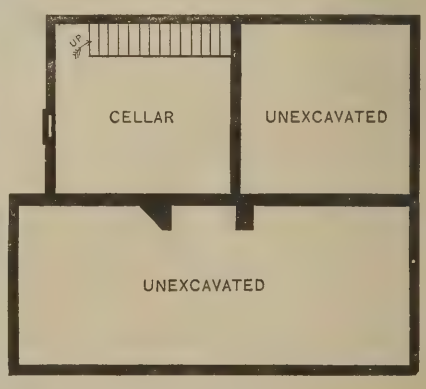
Our readers are measureably familiar with a number of important improvements in the construction of a window sash and in the mode of hanging and adjusting them which have been introduced in this country during the past 25 years or more. One of our English exchanges, commenting on an exhibition of building appliances recently held in England, discusses this subject, and, although the improvements referred to are for the most part such as have originated outside of this country, the description cannot fail to be interesting to our readers generally. The account is as follows:



Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

Since the days of Queen Anne, when the sash window seems to have largely superseded the old English casement of the Tudors, people have been contented with the ordinary mode of opening sashes by weights and pulleys, and up to the present day the larger number of residences are fitted up upon precisely the same model as that adopted during the Georgian period. Little or no improvement has been made in the details of the wooden sill, the "meeting" rails and the construction of the pulley stiles, the forms of which still retain their early peculiarities; and it is only in houses built after improved methods that we find any attempt made to alter these forms or to improve the method of handing the sash. Visitors to the Health Exhibition will have noticed several improved systems in going through certain departments of the exhibition, which are unheeded by the great throng of sightseers, as mechanical appliances of little interest to them. Some of these improvements are attempts to get over the difficulty of cleaning the outside of the sash. In small windows the difficuly is not great, as one's arm can reach to the upper panes; but in large windows, such as those fitted in town houses of any size, there is not only difficulty, but danger, in the attempt to clean the outside.

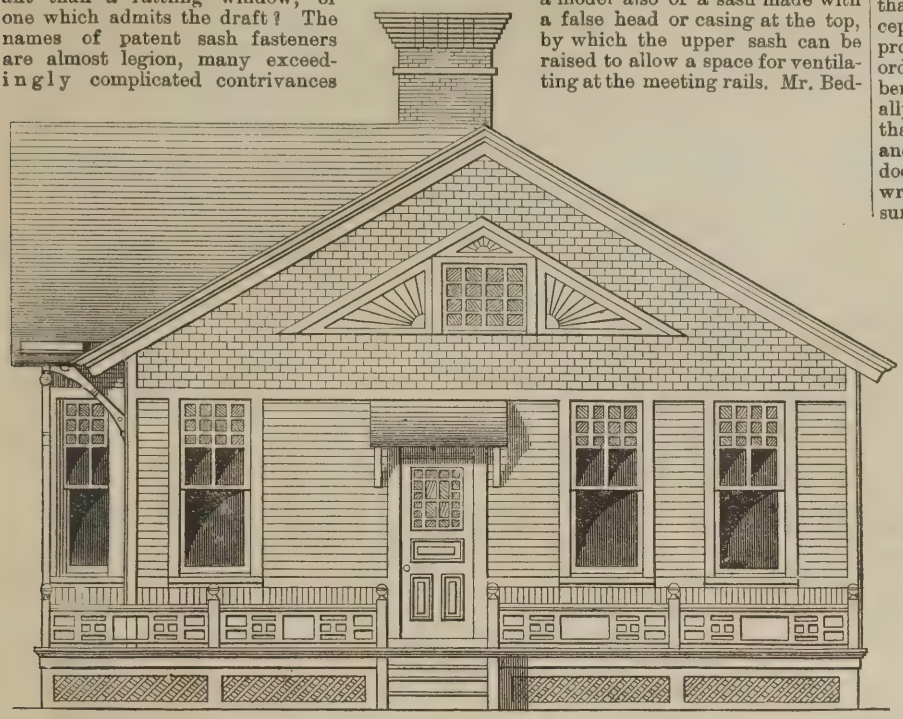
Several patents have been taken out for improvements in sash-hanging, many of which have fallen through from apathy on the part of architects and builders in availing themselves of improvements; the consequence is that nine-tenths of our houses have windows of the old type. Some way of removing the inside beads and disconnecting the sash from the pulley-cords, so as to let the sash fall inward, has been the chief effort with many inventors, though the difficulty of the upper sash remained, and the problem presented itself of making the parting bead between the two sashes movable, to supersede it altogether, or to press it back so as to allow the upper sash to be taken out. There are different methods that have been patented for effecting the object which are pretty well known to our readers. One of the methods devised consists of being able to convert the vertical sliding motion into a swinging action by movable metal tongues, the sashes being turned round upon centers in the pulley stiles by certain alterations in the construction of the stiles—a plan adopted with much ingenuity in the new patent "anti-accident" window of Mr. R. Adams, whose "National Standard" window is well known to architects and builders. Another plan for effecting the same object is to hinge the beads, and to give a casement or door motion to the sliding sashes when it is necessary to clean them. These are called "double-action sashes and frames," and a working model of one may be seen at the Health Exhibition (exhibit of W. J. Penny). The advantages of either of these methods is that the sashes can be opened or thrown up so as to allow a large piece of furniture to enter or be removed from a room, or for making an exit in case of fire. Another plan that was introduced some time ago was to make the sash frame movable by hinging the whole window on one side—a mode of opening which had the merit of simplicity, though more cumbrous and open to the objection of its being rather an unsafe fixture. Other complicated plans consist of removing the weights through "pocket pieces" specially prepared, and detaching the lines from the sash by other means—patented fittings being used. Such plans could rarely be brought into operation by other than skilled hands, and generally only a joiner could remove the sashes. The sash window has other faults which the skill of inventors has been called upon to remedy. The sashes, if not properly made and fitted and of sea-



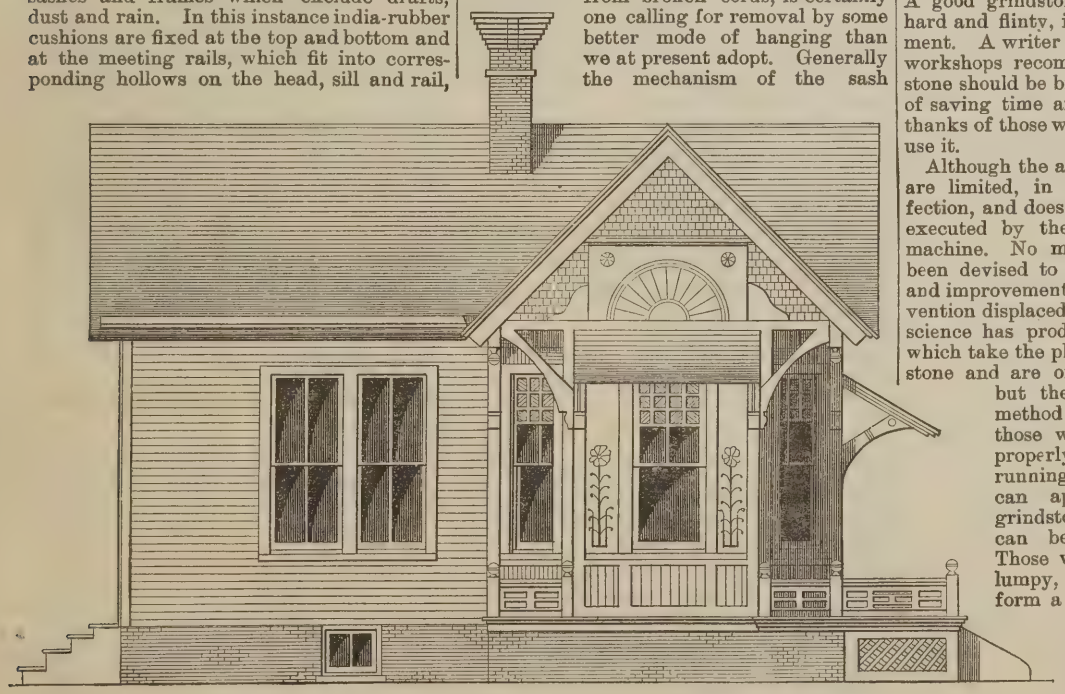
Foundation Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

soned stuff, shrink and let in rain and dust and noise. These are evils which many who live in new houses have to endure, greatly to their own discomfort and to the trial of their temper. What can be more unpleasant than a rattling window, or one which admits the draft? The names of patent sash fasteners are almost legion, many exceedingly complicated contrivances which no one can understand, and others so cumbrous as to disfigure the window to which they are attached.

We know several very excellent fasteners—such as Adams's "adjustable and secure sash fasteners," and Cope's patent fastener—but the greater number of these appliances are sadly out of proportion to their work, or are complex and difficult in operation. A model at the exhibition shows a window (Tucker's) constructed with water-tight sashes and frames which exclude drafts, dust and rain. In this instance india-rubber cushions are fixed at the top and bottom and at the meeting rails, which fit into corresponding hollows on the head, sill and rail, while the parting beads are screwed to the stiles and have a side tongue which fits into grooves at the side of sashes. The plan is effectual if the wearing parts are durable, but we have some suspicion of the endurance of india-rubber in positions exposed to alternations of temperature, wet and cold. Other improvements have been made with the object of allowing the sashes to be partially opened for ventilation; among these may be mentioned Adams's patent sash bolt, by which the sash can be fixed at any distance, and the patent ventilating bar—a capital addition to the ordinary window. There is a model also of a sash made with a false head or casing at the top, by which the upper sash can be raised to allow a space for ventilating at the meeting rails. Mr. Bedborough, architect, patented a plan for effecting the same object, but in a more desirable manner, by making the top sash so much in excess of hight of the lower one that it could be lowered at the rail without draft. Several "improved" windows are constructed so that the sashes are made to balance one another, the opening of the bottom sash lowering the upper one, but the plan is not unobjectionable. The objection to weights, which are very liable to become detached from broken cords, is certainly one calling for removal by some better mode of hanging than we at present adopt. Generally the mechanism of the sash window seems to be a subject of sufficient importance to induce a committee of experts to report upon the matter. The trade might be invited to co-operate with architects, or, perhaps better, a prize might be offered for some improved mode of securing safety, ease of movement, cleaning facilities, ventilation and weather-tight qualities in our conventional window.



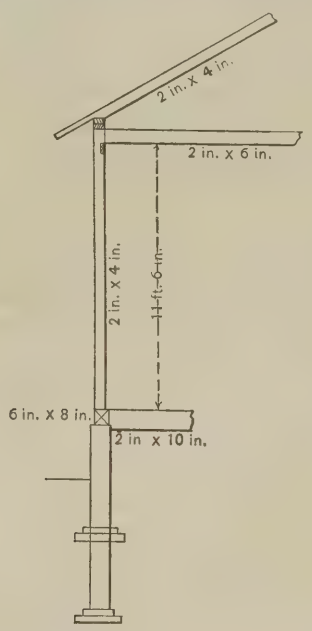
Cottage Design.—Front Elevation.—Scale, ⅛ Inch to the Foot.



Side Elevation.—Scale, ⅛ Inch to the Foot.

Tool Grinding.

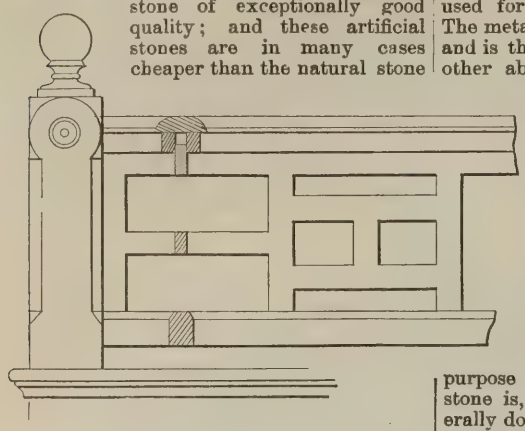
Though probably no workshop tool pays better for the care bestowed upon it or affects the work of the entire shop more than the grindstone, it is almost an exceptional occurrence to find a good stone, properly hung, running true and in perfect order. The shop stone generally has a trough beneath it to hold the water, and, being usually left with a portion of its edge immersed, that part becomes softer than the remainder, and the stone wears unevenly. The out-of-doors grindstone soon becomes a worthless wreck from the effects of the weather, the sun's rays warping the wooden frame and making the stone itself too hard for use. Every employer of edge tools should endeavor to get a grindstone that will do its allotted work well and in the quickest time. A good grindstone, to replace one that is hard and flinty, is always a paying investment. A writer on the economic conduct of workshops recommends that a bad grindstone should be broken up, as the best means of saving time and trouble and earning the thanks of those who would otherwise have to use it.



Section.—Scale, ⅛ Inch to the Foot.

Although the applications of a grindstone are limited, in its sphere it acts to perfection, and does that work which cannot be executed by the planer, lathe or milling machine. No machine or process has yet been devised to supersede the grindstone, and improvement has not added to, nor invention displaced, this primitive tool. True, science has produced artificial compounds which take the place of the original natural stone and are often used advantageously, but they are new only in the method of manufacture. Only those who have used a good stone, properly mounted, with its edge running as true as a turned wheel, can appreciate the value of a grindstone, and only such a stone can be applied to fine work. Those who have worked only at a lumpy, baldly-kept stone cannot form a just estimate of the value of grindstones as applied to the production of the edges of tools in hardened steel. Artificial grindstones are made by binding together silicious particles with silicate of lime, and the process of manufacture is this: Silicate of soda, which is a kind of water glass, is first made by dissolving flints with caustic alkali. Silicious sand of fine and even grain is then mixed with the plastic mass, and the whole is molded to the proper shape. In some cases the stone is treated chemically to render it hard; hydraulic pressure is employed to solidify the material.

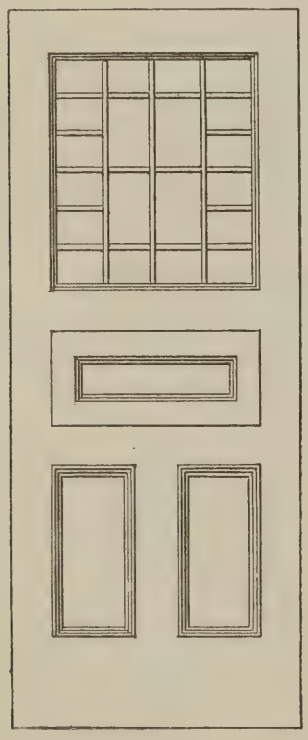
Some stones acquire their hardness by simple exposure to the atmosphere. According to the fineness of the grains of sand used the texture of the stone is modified, and emery may be used in its stead, resulting in a grindstone of exceptionally good quality; and these artificial stones are in many cases cheaper than the natural stone



Cottage Design.—Detail of Balcony Rail.—Scale, ½ Inch to the Foot.

to quarry and shape, which necessitates the expenditure of considerable time, sometimes with a useless result.

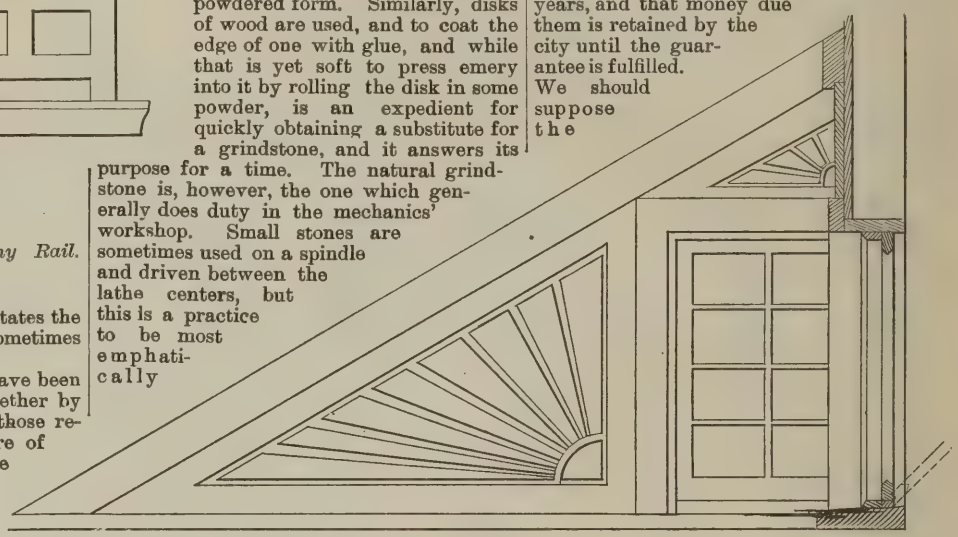
Other kinds of artificial stones have been made in which the grit is held together by various hard-setting cements, but those resulting in a plaster like surface are of little use, lacking as they do the sharp, cutting properties of the natural stone. Emery and sand are mixed with various substances with a view to obtaining a useful whetstone; clay is used in a plastic state, and then baked with the cutting material incorporated in it; shellac and similar substances have the admixture made while they are liquefied by heat. The following receipts



Detail of Front Door.—Scale, ½ Inch to the Foot.

for artificial grindstones have been published: Melt one part of shellac, and add to it three times the quantity of washed silicious sand; emery may be used instead of sand. Boiled linseed is said to form an all-sufficient agglutinant, and merely requires to be subjected to the influences of the air after the abrading material has been mixed with it. When the mass approaches solidity, it is subjected to pressure in molds, and finally hardened by heating. It would be impossible to give a list of the numberless formulæ which have been tried with varying success in the manufacture of emery-wheels, which have now taken a very prominent place in tool grinding. Laps made of soft metal, such as lead and copper, are very extensively used for grinding tools of peculiar form. The metal lap is turned to the desired shape, and is then charged with emery, or some other abradent, and oil; the particles become imbedded in the surface of the soft metal, and make of it a "grindstone" which preserves the shape originally given to it and requires to be continually supplied with fresh cutting material in its powdered form. Similarly, disks of wood are used, and to coat the edge of one with glue, and while that is yet soft to press emery into it by rolling the disk in some powder, is an expedient for quickly obtaining a substitute for a grindstone, and it answers its purpose for a time. The natural grindstone is, however, the one which generally does duty in the mechanics' workshop. Small stones are sometimes used on a spindle and driven between the lathe centers, but this is a practice to be most emphatically condemned. A treadle motion is much preferable to a crank handle, as this necessitates the services of two persons to grind nearly everything. Even the most simple tool requires, as a rule, the use of both hands to guide it on the stone, but when it is attempted to turn the crank handle with one hand, and hold the tool with the other, owing to the motion of the body, in all but very small stones, the tool cannot be held still, and unsatisfactory results must be obtained. The speed at which grindstones are driven in some cases amounts to a surface velocity of 3 or 4 miles per minute, but to attain such a speed it is, of course, necessary to employ multiplying gear and steam-power. For ordinary tool grinding sufficient speed is got by turning a 2-foot stone as fast as convenient by a foot treadle, but when a hand crank is used the stone goes far too slow, and the remnants of a worn-out grindstone only a foot or so in diameter, sometimes to be seen in use turned with a handle of that radius, are quite unfit for any useful purpose. By putting a fly-wheel on the spindle and driving at a good speed such a stone might be of some use, but the trouble it would involve is not worth the saving in a new stone. The first cost of a grindstone is but a trifling consideration, when the long time it will last and the amount of work that it will do are reckoned, and thus it is well to select as good a stone as can be got, as the extra cost, if any, will be amply repaid in the time saved in producing a like, and generally a better, effect with the superior stone.

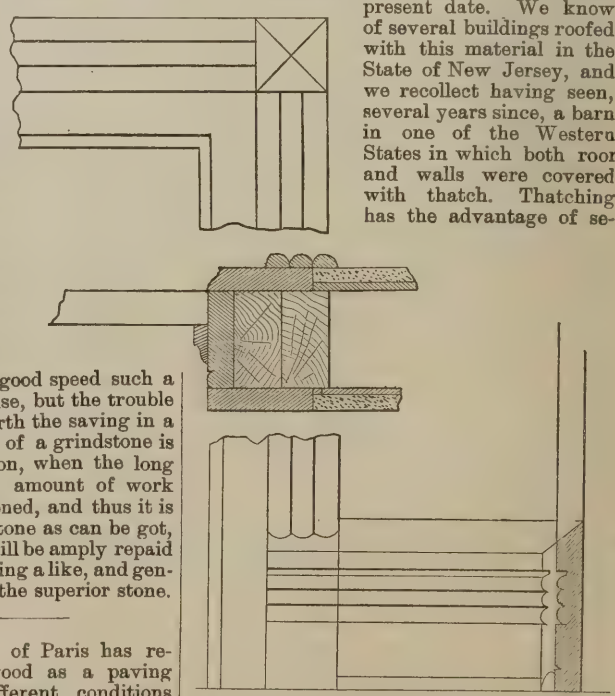
The fact that the city of Paris has returned to the use of wood as a paving material, but under different conditions from those formerly prevailing, leads an exchange to direct attention to the fact that it is everywhere recognized at the present time that the foundation in a street or roadway is the important thing. Surfacing may be done in granite, or broken stone, or wood, asphaltum blocks or in sheet asphaltum, according to the qualities most needed, but none of these materials will make a satisfactory pavement unless they are laid upon a sure foundation. Wooden blocks have some qualities that highly recommend them for use as pavements. A fatal objection to them, however, is their absorption of moisture and their consequent liability to rot. This has a bad effect on the public health and makes their employment expensive on account of their short life. In connection with the statement that Paris has again commenced using wooden blocks in her pavements, the assertion is made that contractors in that city who lay pavements are required to guarantee their work for 18 years, and that money due them is retained by the city until the guarantee is fulfilled. We should suppose the effect of this where wooden blocks are employed would be to drive contractors out of the field, or at least to compel those who may have the temerity to venture upon such a guarantee to think twice before signing such a contract. Probably there is some mistake about the terms of the guarantee, which, as above stated, would seem to be altogether unreasonable.



Detail of Gable Window.—Scale, ½ Inch to the Foot.

Thatched Roofs.

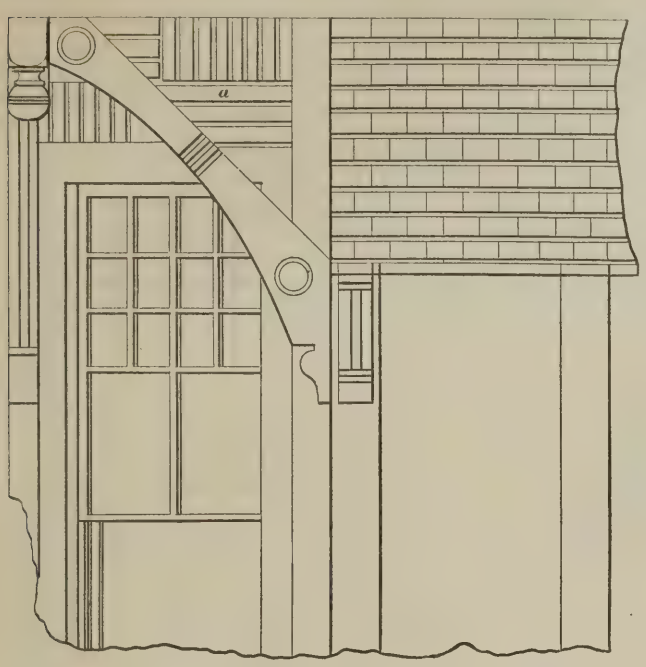
Thatched roofs are not very extensively employed at the present time, although they are occasionally encountered even at the present date. We know of several buildings roofed with this material in the State of New Jersey, and we recollect having seen, several years since, a barn in one of the Western States in which both roor and walls were covered with thatch. Thatching has the advantage of se-



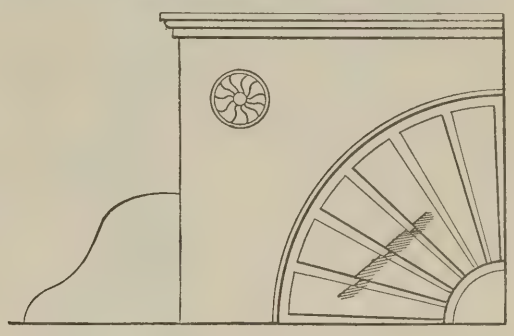
Inside Finish.—Scale, 1½ Inches to the Foot.

curing warmth in winter and coolness in summer, but it is subject to injury of parts and to risk from fire. Some of the ancient English churches, notably those in Norfolk and Suffolk, were formerly

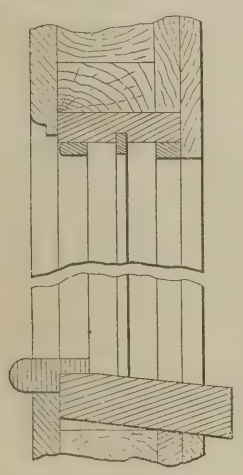
covered by thatch. The thatcher required for the practical execution of his work an ordinary stable fork with which to toss the straw before being made into bundles; a thatcher's fork with which to carry the straw from the heap up to the roof; a thatcher's rake to comb down the straw straight and smooth; a knife, or, as it is sometimes called, an eaves knife, to cut and trim the straw to a straight line; another form of knife to point the twigs with which the bundles of straw are held in place; a half glove of leather to protect the hand when driving in the smaller twigs or spars; a long flat needle; a pair of leathern gaiters to come up above the knees, used when kneeling on the rafters. With reference to the durability of thatch, according to Gwilt, from whom the above description of tools is taken, wheat straw may be depended upon to last from 15 to 18 years, while oat straw endures only about eight years. That celebrated architect, Viollet Le Duc, in describing thatchwork, alludes to the custom of forming the ridge in mud, into which plants and grasses were inserted to prevent the earth being dissolved and washed away by rain. This practice may have been the origin of the present fashion of ornamenting roofs by crestings. Gwilt says that some of the old thatch roofs dating from the middle of the fourteenth century and earlier had species of crestings formed on the withes or willow twigs used to bind the thatch, and arranged on the tops of the roofs in an interlacing manner, terminating with a spike having a rudely-formed weather-vane or other appropriate top ornament.



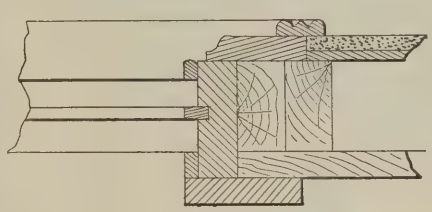
Cottage Design.—Octagon Window, Brackets and Hood.—Scale, ½ Inch to the Foot.



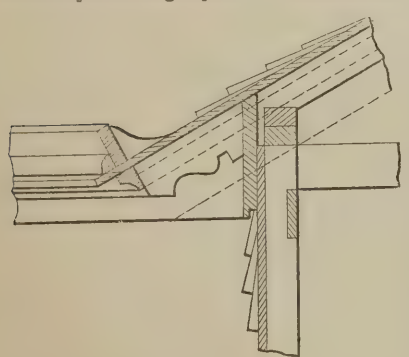
Detail of Gable Ornament.—Scale, ½ Inch to the Foot.



Vertical Section Through Window.—Scale, 1½ Inches to the Foot.



Horizontal Section Through Window.—Scale, 1½ Inches to the Foot.

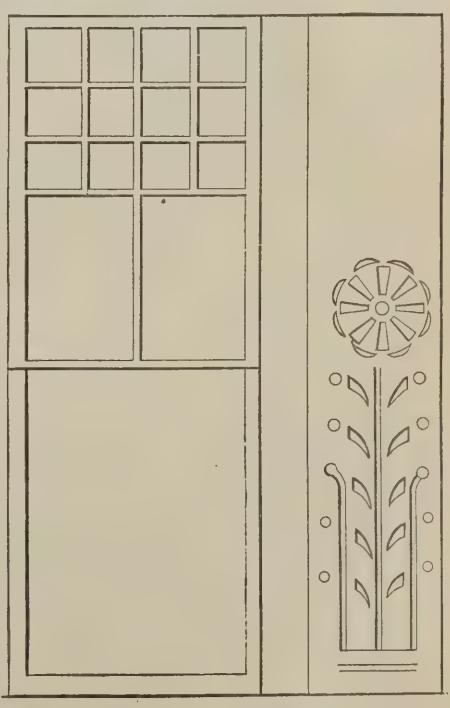


Main Cornice.—Scale, ¼ Inch to the Foot.

The finest and most costly piece of furniture ever conceived was the famous "peacock throne" of Delhi. Tavernier, a skillful French jeweler, saw it and made a computation as to its intrinsic value. He calmly estimated that its nominal worth, aside from its claims in an artistic way, was $30,000,000. It was but 6 feet high and 4 feet broad, but it was composed of solid gold inlaid with rare Oriental gems. It received its name from the jeweled images of peacocks which adorned its canopy. This canopy was also of gold, supported on 12 gold pillars, and hung all around with a fringe of pearls. On each side of the throne stood two chuttahs, or umbrellas, symbolical of royalty. They were made of crimson velvet, embroidered with gold thread and pearls, and were equipped with solid gold handles and diamonds. This throne was constructed by Austin de Bordeaux, at the order of Emperor Shah Jehan, the same enterprising monarch who had constructed the Taj, the pearl mosque of Agra and the other most remarkable monuments of architecture in those parts. The peacock throne was carried away by the Persian Nadir Shah, while the jeweled ceiling was melted down by the Mahrattas at the time of their invasion in 1759. This ceiling was valued at about $850,000.

Window Ventilation.

No time could be better than the present, says the *Lancet*, for beginning the practice of house ventilation by the window, which is still, in the majority of houses, the readiest and the safest means of obtaining a regular and constant supply of fresh air. The practice, begun in warm weather, may be carried on with proper care through autumn and winter. The constantly accumulating impurities derived from breath, from perspiration, from excreta of other kinds collected in sleeping-rooms, from the use of gas or lamp light, and too often, even now, from suction of sewer-gas from waste-pipes by the heat of house fires, &c., render it as necessary for health as for comfort that these should have free egress, that they should be substituted by the pure outer air. Fresh air from without may very easily be had without draft, and without risk of cold even to delicate persons, if a few simple rules be observed. The cold air of winter, of course, enters with greater force and in greater proportional volume than the more equal summer air into a warm room. The aperture of ingress must be correspondingly diminished. Air from a window is preferable to that from an open inner door, no matter how roomy the house, from its more reliable purity. If the window be the inlet, the fire, fireplace, or it may be the door of a room in summer, acting as an outlet, it may be opened from the top, the extent being regulated according to the outer temperature. A window should never be made to ventilate by opening it from below, unless the open lower space be fillen up in some way and ventilation be carried on at the middle where



Detail of Window and Ornament.—Scale, ½ Inch to the Foot.

the sashes join—otherwise drafts are unavoidable. The ventilating pane is a hardly less simple and equally efficient and safe method with either of the others. Window ventilation is especially useful in bedrooms, and its efficiency or otherwise cannot fail to affect the vital powers of the occupant, who in his slumbers must trust to other energies than his own for the removal of these impurities and morbific germs which his every breath multiplies around him.

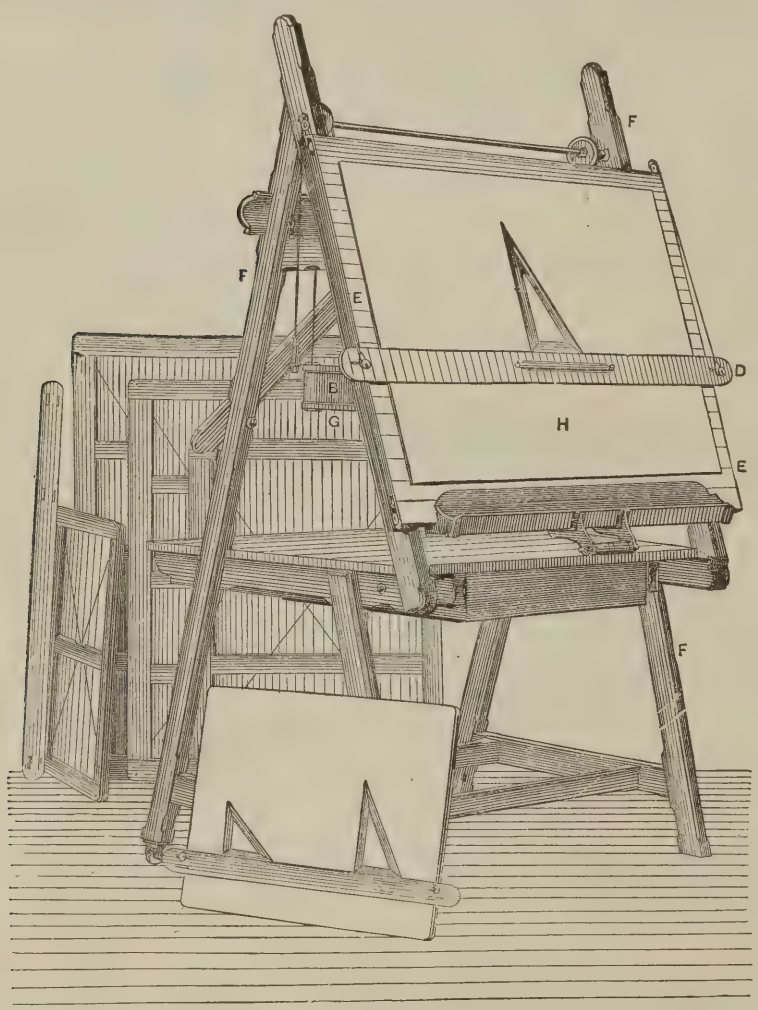
Improvements in Drawing-Boards.

BY THEODORE BERGNER.

It is a fact universally acknowledged among engineers and draftsmen that the drawing-board and T-square are, in their dependence upon one another, and even at the best of their various modifications of construction, only imperfect and unreliable means with ordinary care for drawing absolutely parallel lines. Among the attempts to make the board and T-square more reliable, various modifications of construction have been devised; many kinds of wood have been tried, selected with utmost care and subjected to every conceivable manner of seasoning, and, when all of these efforts failed to make those mutually dependent implements thoroughly reliable in their fundamental requirements for reasonably accurate work, resort was even had to expensive steel T-squares and to boards with steel edges. These, if leading to greater accuracy on the one hand, have to be handled with great care, while the weight and sluggish friction of such a metal T-square or blade interferes seriously with the quick handling and ready yield to slight pressure essential for the uniform gradation of narrow spaces between the lines. The subject to which attention is now invited is the result of persistent efforts to arrive at more absolute accuracy in the drawing of parallel lines, and this by making the action of a parallel ruling device quite independent of the edges of the drawing-board upon the relative degree of truth of which the T-square is dependent. I succeeded in accomplishing my object in a very simple and effective manner by means of an endless cord, stretched crosswise over four little grooved pulleys provided at the corners of the board in the manner shown at Figs. 1 and 2 of the drawings.

* * * * * * *

The drawing-board I prefer to make, for several good reasons, of a thin top slab of wood, A, secured upon a rectangular open frame, *a a*. By crossing the cord *c* underneath the slab A, the two portions of this cord which run parallel with two opposite edges of the board are made to move in the same direction, or, in other words, if the portion of the cord on the right-hand side of Fig. 1 be moved a distance of 1 inch upward, in the direction of its arrow, the left-hand portion of the cord must advance the same distance in the same upward direction, as indicated by its arrow. This equal amount and direction of movement of the cord *c* at opposite sides of the board is imparted to the blade or parallel ruler D by securing the ends of the latter to the cord in the manner shown in Figs. 6 and 8, and which I will briefly describe. The ruler D carries at each end, at its under side, by means of a screw, *d*, and milled nut, *e*, the cylindrical block *f* and the elastic metal clamp *g*. The jaws of this little clamp are open at the end next to the board, and, when tightened in this position, take a firm hold of the cord, in the manner indicated at Fig. 6. The tightening of the clamp *g* by means of screw *d* and nut *e* secures at the same time the block *f* firmly to the ruler D. On the other hand, the release of clamp *g* also loosens the block *f* from the ruler and permits its outward withdrawal in the slot *h* (as in Fig. 7), so as to liberate the cord entirely from the clamps *g g* when it is desired to detach the ruler from the board. The accurate parallelism of motion obtained in this way is, as will readily appear, is now independent upon the condition of the board, the edges of which may be considerably out of truth without in the least impairing the functions of the cord *c* and ruler D. As a test of the degree of accuracy obtainable by this device without special care, or even with such manipulation as would presumably tend to adverse results, two blank cards may be fastened at opposite ends to the board at hand, the endless cord of which is over 17 feet in length, and of very moderate tension. If a series of lines be drawn across these cards, and these lines shall prove to be parallel, although in moving the blade alternately it is grasped at extreme ends (that is, having drawn a line, for the next line move the blade by its right end, then by its left end, and so change about for a series of lines), it will be a satisfactory demonstration of the device. The true parallelism of these may now be observed by bringing the edges of the two cards together. Any required degree of inclination of the ruler in either direction from the horizontal line may be given, and correctly maintained, by securing its two clamps *g g* to the cord *c* at such relative points as will produce the desired angular position of the ruling edge. Considerable end play of the ruler is not only admissible without impairing true parallelism of lines, but some play is actually needed to compensate for inaccuracy of the board by permitting the blocks *f* to slide freely past the widest part of the board, as its edges are likely to be neither straight nor parallel. To a feeling of security and full reliance upon the correct action of this ruler which the draftsman soon experiences comes that sense of ease with which he finds he can move his blade up and down, taking hold of it for that purpose at any most convenient point. It soon makes him forget that unceasing care with which his left hand always had to bear upon the blade, and at the same time press the head of his T-square against the guiding edge of the board, while his right hand was drawing the line along the blade, which he found more and more yielding and insecure the further the work was remote from the head-block of his T-square. After the practicability of the new parallel motion was assured, very little reflection naturally suggested the adaptation of such boards to an upright position, and this change was, especially for large work, soon found to offer such remarkable advantages, both from a sanitary and technical standpoint, that it was promptly adopted in a number of large engineering offices.



Improvements in Drawing-Boards.—General View of the Board Described by Mr. Theodore Bergner.

The general view presents a clear, comprehensive outline of this upright class of the improved boards. In this construction a frame, E, is mounted upon a stand or easel, F, at an inclination of about 20°. By means of a counterweight, G, in the rear, and two wire cords running over pulleys at the top, the sliding of this frame up and down is made very easy, so that any portion of the drawing may instantly be brought into the most convenient position for work upon it. The parts for the parallel motion of the blade are fitted to this frame, which is so recessed as to receive a plain board, H, that can be instantly removed, and another one of same size or of smaller dimensions put in its place, so that any number of boards for a whole series of views of a complicated machine or structure, or for different plans in progress, may be in hand simultaneously and readily interchanged. On these upright frames the blade D is necessarily also counterweighted, as shown, to make it slide with the least resistance in either direction, and to hold it in any position. In these vertical boards the tension of the cord is adjusted by means of a button, over which the cord is wound at one end of the blade; a partial turn of this button in one direction increases the tension and in the opposite direction slackens the cord. The clamp at the other end of the blade provides for the adjustment of the latter, so as to place it either in its normal horizontal position or to set it for any required amount of obliquity in either direction. The tension of the cord in the smaller boards is regulated with ease by a button plate, *i* (Fig. 3), carrying two little grooved rollers, between which the cord passes, and which either slacken or tighten

the cord (as seen in Fig. 3) by respective change of position of the button-plate *i* about its axis, upon which it is made to turn with sufficient resistance to prevent undue change of position.

I will add, in this connection, some remarks which may be of interest as bearing upon a peculiar material I discovered during early experiments, and the superior qualities of which led to its adoption in the making up of these boards. Having decided upon the use of a thin slab of soft wood for the top of the boards, with a strong, open frame underneath, through openings or slots in which the crossed cord was readily passed, and which frame, as the stronger member of the two, would keep the thin slab from warping, I experienced some difficulty in finding uniformly clear, straight-grained thin stuff, properly cut from the log, and so thoroughly seasoned as to withstand satisfactorily the effects of varying temperatures, was sound and in good condition at the close of the exposition. Having had my longing eyes on this wood for months, I was highly pleased to find the exhibitor's representative willing to turn it and the shipping case over to me at a nominal figure. I had it packed for return to this country.

Soon after receipt of my precious freight in Philadelphia, I had the whole of it made up into drawing-boards, with such success that the same quality of material, from the same source, has been procured for the boards ever since. It is simply faultless. Upon further inquiry into the source and manner of preparation of this material, I found that the manufacturer is not only very largely engaged in supplying many piano-makers of this country either with made-up sounding-boards or with the stuff for them, but that he exports largely to Europe, having a branch house at Leipzig, Germany. On his extensive tracts of forest in the best spruce region of this State this immense business has been organized upon the basis of long practical experience and science combined. Of the faultless trees selected, only the butts are used, which secures a clear and straight-grained article. All such logs are invariably quartered first and then sawed ⅝-inch thick, the cuts running as nearly parallel as possible to the radius of the tree. After the boards have been exposed to the frost and open air under sheds for several months they receive a thorough additional seasoning in steam-heated rooms, and are then planed on both sides down to $\frac{7}{16}$ inch or ⅜ inch and edged. Then commences a careful classification of the boards. They are first assorted with regard to their color, grain and clearness, then again according to length and width, so that finally each lot represents in every respect a perfectly uniform standard of quality. The corner-pieces of the quarter logs which are not wide enough for boards are cut into bars for sounding-boards, or are used for making other minor parts of the piano for which spruce is suitable.

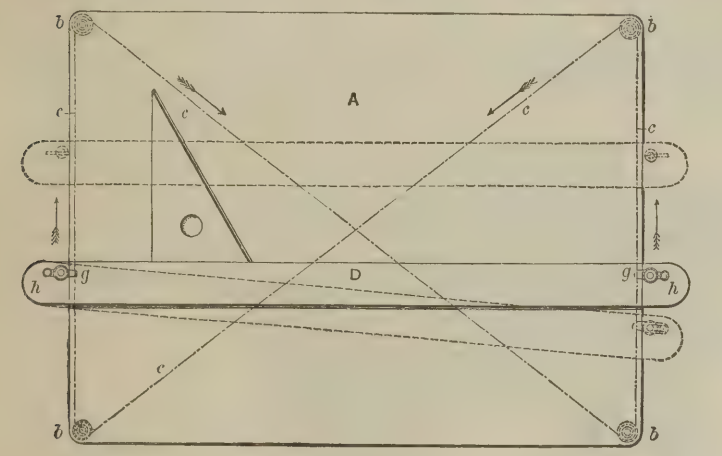


Fig. 1.

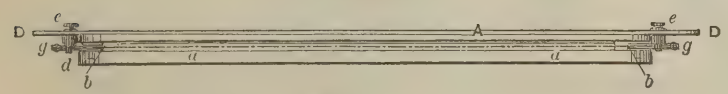


Fig. 2.

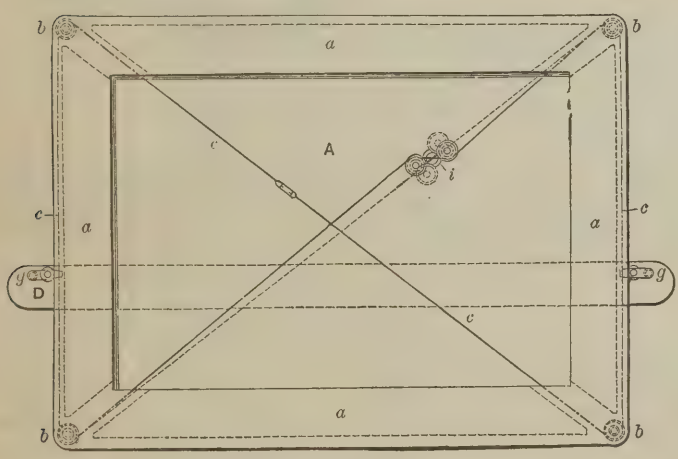


Fig. 3.

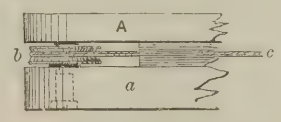


Fig. 4.

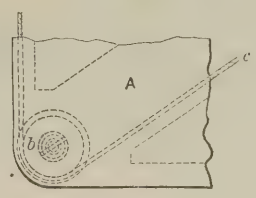


Fig. 5.

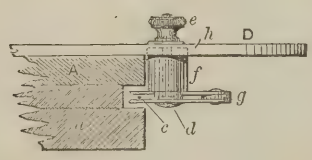


Fig. 6.

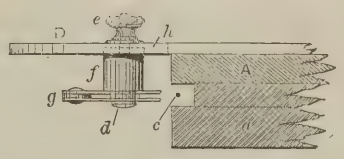


Fig. 7.

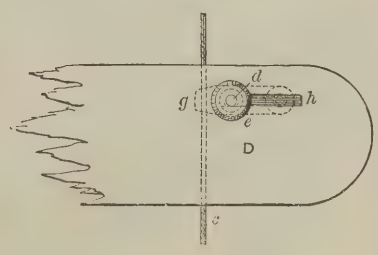


Fig. 8.

Improvements in Drawing Boards.—Details of Construction of Drawing-Board Illustrated on Opposite Page.

Hanging a Grindstone.

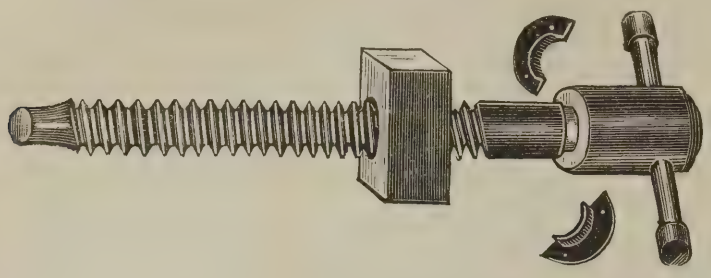
To hang a grindstone on its axle to keep it from wobbling from side to side requires great skill. The hole should be at least ⅜ inch or ½ inch larger than the axle, and both axle and hole square; then make double wedges for each of the four sides of the square, all alike and thin enough so that one wedge from each side will reach clear through the hole. Drive the wedges from each side. If the hole through the stone is true the wedges will tighten the stone true; if the hole is not at right angle to the plane of the stone it must be made so, or the wedge corresponding must be altered in the taper to meet the irregularity in the hole.

Concerning the above method of hanging a grindstone, a correspondent of one of our contemporaries writes as follows: "The method described has been in use as long as the grindstone itself, but it is not the way to do it to-day. Wedging the center of a stone is a great help to burst it, and when the speed is excessive the wedging strain is an important factor in the life of the stone and the safety of those around it. The best and easiest way, and the scientific way, to hang a grindstone is by a nut and collars, almost like a circular saw, and exactly like an emery-wheel. If the hole in a grindstone is 6 or 7 inches square (as usually made) fill up with a piece of green timber. If live timber is not available, soak a piece of wood over night in water; then it will not swell when wet and exert a destructive pressure on the stone. Take a pair of big dividers or a trammel, and find the center of the stone. Do this upon each side of the stone, and bore the hole from both sides. Bore a little larger than the shaft, or burn out the hole if your auger is not quite large enough. See that the stone is decently true upon its sides where the collars bear. If not so, either chip the stone or mount it temporarily and turn the sides true. Now put it on the shaft and screw up. True the face of the stone, as it is not probable that you will get it to run exactly true. You now have a grindstone that will not come loose by getting dry every time it stands without water a day or two, and is not apt to split open when first wet. When that stone gets worn down to 18 or 20 inches in diameter, it pays to split it, and make two narrow stones, provided it was 6 or 7 inches thick originally. To split a stone, turn a groove ⅜ or ½ inch wide, and as deep as convenient—2 inches will do, but 3 is better—in the center of the face. A piece of ¼ or ⅜ inch gas-pipe is the tool to use for turning the groove. Drive the groove full of dry pine wedges. Have them fit as well as possible. Do not drive too hard, or you may break out a piece and spoil the stone. After the wedges are all fitted lay the stone in water or keep it wet, and it will split in two at its leisure."

NOVELTIES.

Patent Metallic Vise Flange.

The accompanying illustration, Fig. 1, represents the patent groove bench screw, with patent metallic vise flange, which is made by the Ohio Tool Company, of Columbus, Ohio. The operation of this improvement will be readily apprehended without a detailed explanation, and for it the following advantages are claimed: That it obviates the necessity of mortising the jaw of the vise, and thereby weakening it; that it secures accuracy in working; that it does away with the friction and wear of the end of the head of the screw against the jaw of the vise; that less strength is required in tightening; that the jaw is carried squarely and firmly and works more freely than in the ordinary vise, and that the flange adds strength and durability to the vise at the essential point.



Novelties.—Fig. 1.—Ohio Tool Co.'s Bench Screw, with Patent Metallic Vise Flange.

Saw-Horse Heads.

The article illustrated in Fig. 2 is the invention of Mr. Bailey, manager of the Gleason & Bailey Mfg. Co., of Seneca Falls, N. Y., by whom it is put on the market. The general appearance and utility of the device is indicated in the illustration, the heads having loops in the sides, as shown, for the admission of the legs, and other loops for the rail. It will be observed that, instead of having a rail of heavy stuff, the heads are made with two parallel openings adapted to the use of two pieces of 1-inch lumber side by side, the wall between the openings giving a space between the rails of ¼ inch for the reception of saws, chisels, &c. The heads are made in three sizes, as follows: No. 1, 2-inch legs, 2½-inch rails; No. 2, 2¼-inch legs, 2¾-inch rails; No. 3, 2½-inch legs, 3-inch rails. The are made of cast or malleable iron, or brass, if desired. They are intended especially for the use of carpenters, stucco workers, plasterers, masons, &c. It is stated that in point of strength these saw horses are much superior to the old, and the further advantage is mentioned that they can be carried in the tool-chest by taking out the legs, a change which is very readily made. Their cheapness and durability are also alluded to, as well as the convenience of having one saw-horse capable of being changed without screws or nails from one hight to another.

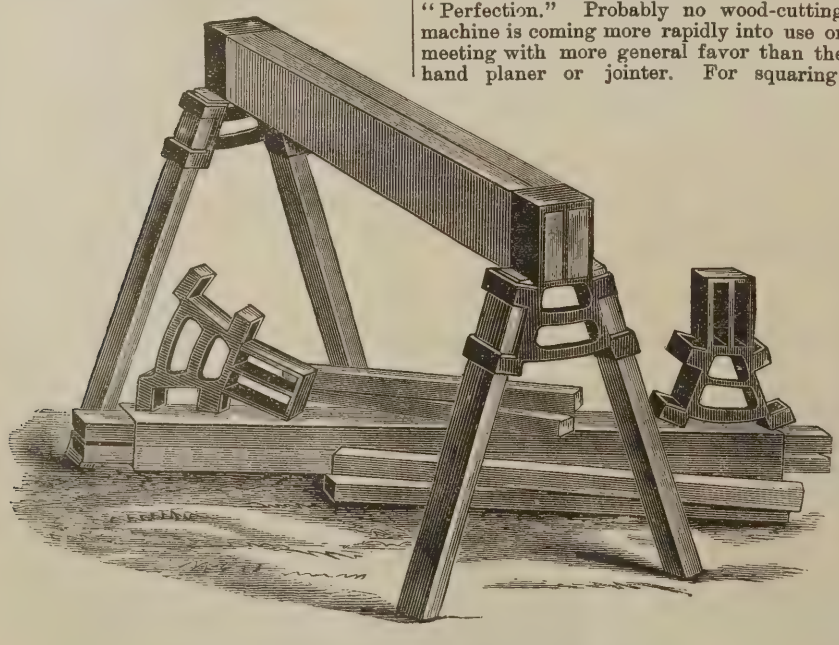


Fig. 2.—The "Multum in Parvo" Saw-Horse.

A New Buzz Planer.

Fig. 3 of our illustrations represents a hand or buzz planer recently brought out by Frank H. Clement, 131 Hill street, Rochester, N. Y., and which has been named the "Perfection." Probably no wood-cutting machine is coming more rapidly into use or meeting with more general favor than the hand planer or jointer. For squaring smoothing, taking out of joint, glue jointing, beveling, chamfering and various other similar kinds of work no other machine can take its place. The frame of this machine, as may be seen from the engraving, is cast in one piece. It is heavy and strong, and has three points of bearing on the floor. The tables move on continuous inclined ways, and are double-ribbed in both directions. The cutter-head is a solid steel forging with bearings 5 diameters in length, and provided with self-oiling boxes. The rear table has a rabbeted groove 5/8 inch deep, and an adjustment for making hollow glue joints. By a special system and tools which the manufacturer employs the frame and tables are planed absolutely exact, so that no further fitting, adjusting or lining up is required. Three sizes of this machine are made, namely, 10-inch cut, 15-inch cut and 20-inch cut. The special advantages to which the maker directs attention are as follows: There are no links, wedges, pin joints or eccentrics under the table to get out of adjustment or wear slack. The frame resting on three legs makes it impossible to strain it or twist the machine by bolting down to the floor or by the settling of the building. There are no projecting flanges for the operator to tread upon. By means of the large hand-wheel at the right, the working table can be moved instantly either way without requiring the operator to change his position in the least. The design and method of fitting up are such that the tables must be true and remain so. They cannot twist, rock, strain or be displaced.

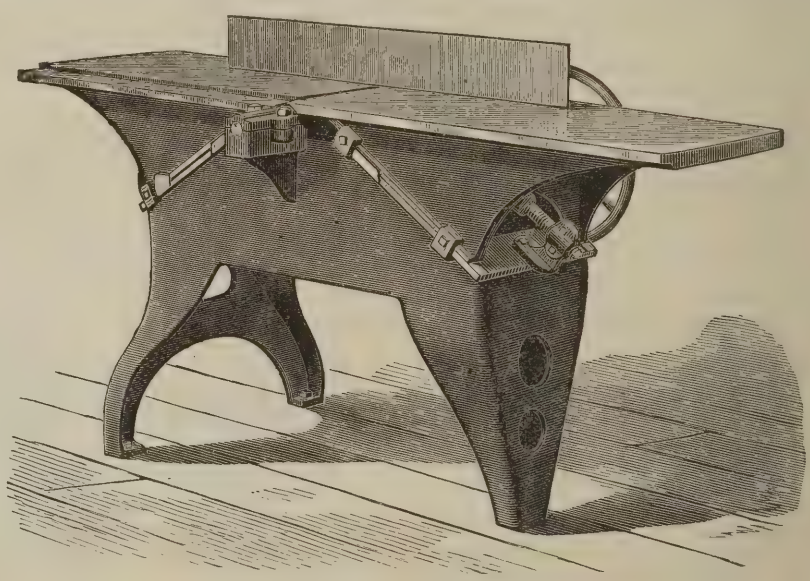


Fig. 3.—A New Buzz Planer.

New Metallic Plane.

The illustration presented in Fig. 4 represents a patent adjustable smooth plane, which is one of the line of metallic planes made by the Meriden Malleable Iron Company, Meriden, Conn. These planes in general appearance are similar to some others on the market, but they possess special features which are secured by a number of patents. The cutting iron is clamped to the carriage, which slides in a V-shaped groove with little friction, making it easy of adjustment and giving a solid bearing. The screw which operates the carriage has a shoulder which works in a slot, thus preventing the "back lash" or lost motion which is experienced as an objection in other planes. The wedge, cutting iron and carriage are fastened together in the following manner: The cutting iron is secured to the carriage by a screw passing through the cutting iron into the wedge, and projecting downward, having a shoulder that passes into a slot in the carriage, of sufficient length to allow for the wearing away of the cutting iron in use. In operation this cutting iron would be placed near the position at which it would be required, and the wedge then tightened by the use of the screw shown on the face, and the adjustment of the cutting iron completed by turning the screw underneath, which moves the carriage out and in, as desired. Another feature to which special attention is directed is the adjustable mouth or throat. This is not represented in the cut.

The stock in front of the mouth consists of two pieces, the lower part being a slide secured to the main stock by a screw and operated by the knob, which is also used as a handle, shown at the front of the tool. A slot in the upper side of the stock admits of an adjustment giving a mouth which can be varied as desired for coarse or fine work. By this

Novelties.—Fig. 4.—The Meriden Malleable Iron Co.'s Metallic Plane.

arrangement the mouth can be opened wide when required, or closed so as to cut the finest shaving without any liability of the slide coming in contact with the edge of the blade. The manufacturers announce that the blades of their planes are made of the best English steel and that every plane is thoroughly tested before it leaves the factory. They also direct attention to the neat shape of the tools and the fact that, while the frame or body is light, it is still sufficiently strong for all uses. Their catalogue shows that, in addition to the smooth plane represented in the cut, they are making jack, fore and jointer planes, block planes and others.

Brick Mantel.

Fig. 5 of our engravings represents a mantel and fireplace made wholly of brick. It is one of a number of designs which have recently been put out by the Peerless Brick Company, of No. 1003 Walnut street, Philadelphia. Brick mantels and fireplaces of this general description are becoming very popular for use in hall, library, den, dining-room, billiard-room, &c. For the most part the designs for work of this kind are supplied by architects, but the company also furnish designs when required. The various patterns of brick supplied by this company can be utilized in producing attractive compositions. The design shown is one which the company have set up in one of their offices for inspection of those who call. Variations in the appearance of a design may be obtained by combinations of color; brown, gray, buff and red may be used interchangeably or in combination, and accordingly different effects may be produced in the same design. The effect of colors is in a measure indicated by the different tints in the engravings. Mantels of this kind are readily put up by local masons, from the fact that very complete working drawings are sent by the company, leaving very little calculation to be performed by the workmen employed. The bottom of the fireplace is made of soapstone, although the company furnish tile when required. The shelf is of wood, slate or marble, as desired.

Fig. 5.—Fireplace and Mantel of Brick.—The Peerless Brick Co., Philadelphia, Pa.

The Square-Hole Auger.

The Square-Hole Auger Company, Wooster, Ohio, are putting on the market a machine of novel performance, a general view of which is afforded by Fig. 6 of our illustrations. It is described as a labor-saving machine constructed on a principle entirely new among carpenters' tools. In appearance it is similar to the common boring machines used by carpenters in framing. The power is applied in the same way, but in place of an auger there is used what is called a squaring tool, which is made in the following manner: To a driving-shaft extending through a metal stock there is attached a point which operates a raking cam; to this cam is fastened a two-edged knife which is provided at the ends with cutters, or saw teeth, sharpened on the inner side. These prevent the splitting of the wood at the ends of the cut. The knife, thus adjusted, cuts on both sides, from the center outward, by an oscillatory motion, and makes a square hole, with corners and sides cleanly and smoothly cut.

The machine which is now being introduced is provided with a positive feed, and cuts a 2 x 2 inch hole. This may be enlarged in either direction by simply moving the machine from the first cut in the direction required. As may be seen by the engraving, the machine is adapted to cutting gains as well as mortises. The makers' claim for this machine is that it obviates the necessity of using either mallet or chisel, thereby saving the labor of at least two men. The manufacturers also claim that better work is accomplished with it than can be done with a round auger, mallet and chisel. The machine is so constructed that any auger can be used in it, as in an ordinary boring machine, by making the shank of the auger fit the socket where it is to be attached It is stated that no more power is required to sink a square 2-inch hole with this machine than to bore a round hole of the same diameter in the ordinary manner. In cutting through a piece of timber there are no

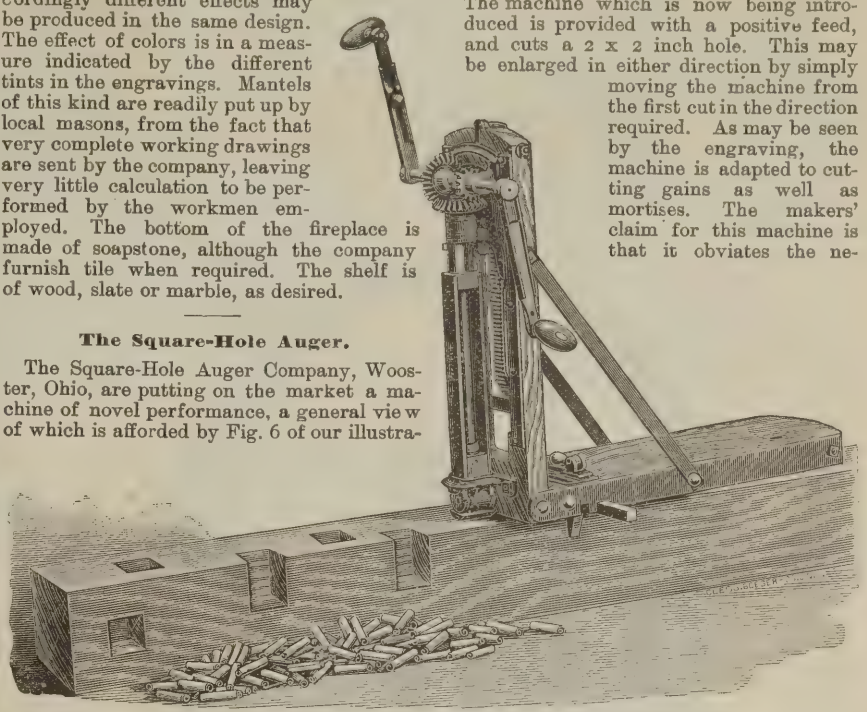
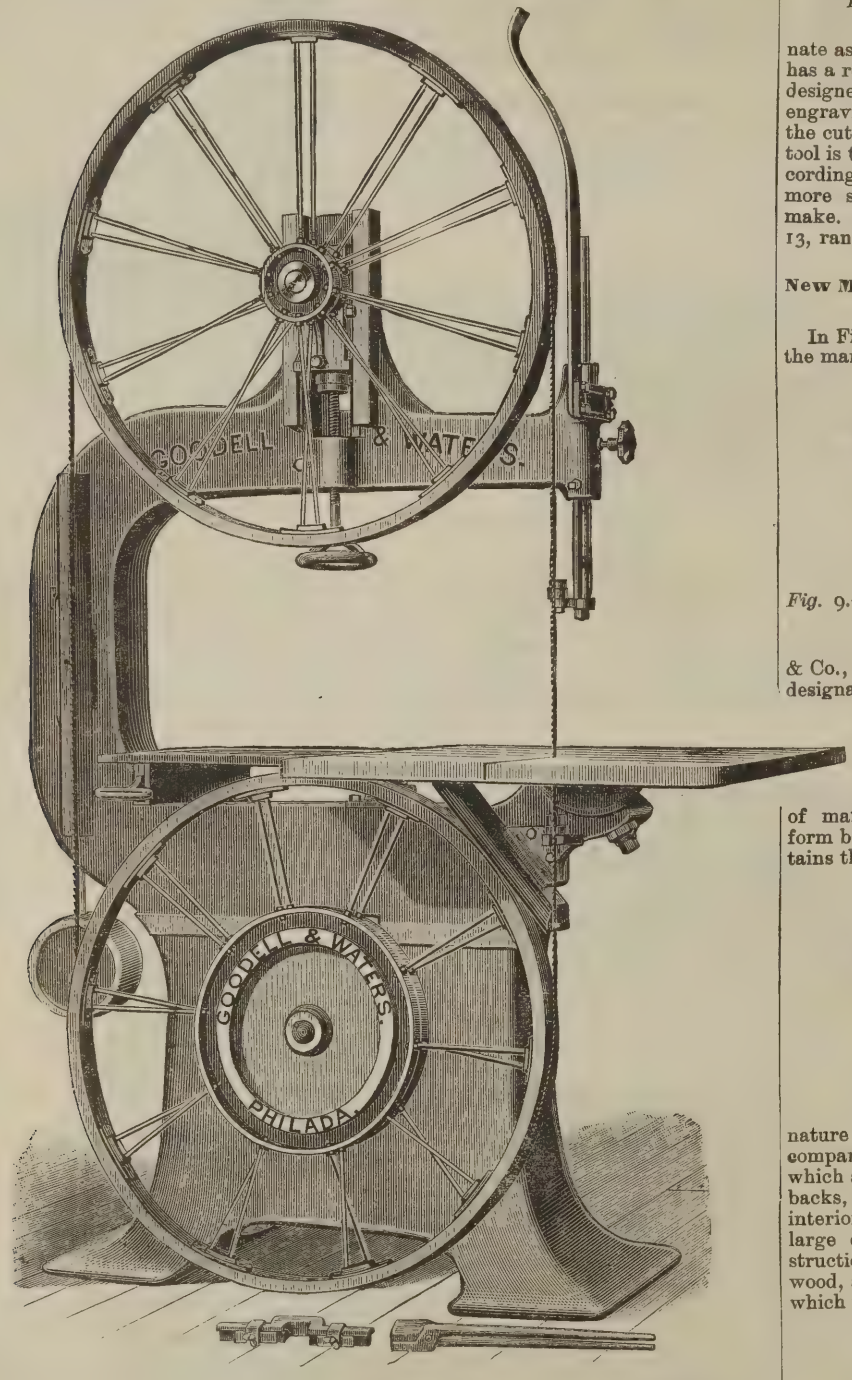


Fig. 6.—New Mortising Tool, Made by the Square Hole Auger Co., Wooster, Ohio.

splinters or ragged edges on the under side. We understand that the company have in contemplation other sizes of stocks and knives, and will be able soon to furnish them ready to be attached by the operator to this machine.

New Band-Saw Machine.

It would seem, from the number of band-saw machines which have already been produced, that it would be practically impossible to discover any new ideas to be incorporated in his useful tool. That it is not impossible, however, to add novel features, and such, too, as are desirable, is evidenced by the new articles of this kind that are brought out from time to time. Fig. 7 of our illustrations shows a 42-inch machine that has just been completed by Messrs Goodell & Waters, of Philadelphia. This machine has been made from entirely new patterns, and particular attention has been directed to the working parts, which have been made both heavy and durable. The frame is cast in one piece and is firmly bolted to the base. The wheels are 42 inches in diameter, made on the improved bicycle plan. The makers have given a very careful trial to this feature upon their 36-inch machine, and based on their successes in that case are using it in the present article. The rim of the wheel is made of thin strips of wood glued together and turned up on the inside before the spider is put in. It will be seen that there are no joints across the periphery of the wheel. In the case of the wheel springing out of line it can be adjusted by the nuts connecting the spokes at the hub. By this arrangement the wheels can be trued up in case they become irregular in outline without taking them off of the machine. The lower wheel has a heavy center, whereby a steady motion is maintained at all times, and which prevents the machine from starting off on a jerk, which some of our readers know is the cause of breaking many saws. This is a very common fault with many of the machines that are in use. The machine here illustrated is provided with patent compensating wood and rubber cushions, which, working in combination, provide for the rapid expansion and contraction of the saw blade. By this means the blade is kept at a uniform tension, thus reducing the liability of breakages. This the makers consider a very important and valuable improvement in band-sawing machines The tension of the blade is adjusted by the hand-wheel on the upper frame. The table of the machine is of iron, and is so arranged as to be adjustable for bevel-work. The presser foot is simple and convenient, and will raise 18 inches above the table. The machine is adapted for saws to 1¼ inches in width and 21 feet 4 inches in length.



Novelties.—Fig. 7.—Band Saw Machine, Built by Goodell & Waters, Philadelphia.

Round-Lip Auger Bit.

Messrs. C. E. Jennings & Co., No. 96 Chambers street, New York, are at present supplying the trade with what they designate as their new No. 5 Auger Bit. This bit has a round extension lip, with spurs, and is designed for very fine work. Fig. 8 of the engravings affords an idea of the nature of the cutting edges. A special feature of this tool is that it has a draw cut, and that, accordingly, it operates in fine work much more satisfactorily than bits of common make. These bits are supplied in sets of 13, ranging from $\frac{4}{16}$ to $\frac{16}{16}$ inches.

Fig. 8.—Round-Lip Auger Bit.

New Material for Interior Cornices and Ceilings.

In Figs. 9 to 13 we present views of what the manufacturers, Messrs. Gardner, Holmes & Co., of 183 Canal street, New York City, designate as their patent cove for interior cornices. This article is composed of lamina of veneers, three in thickness, laid crosswise, the front and back layers running at right angles with the middle layer. In the course of manufacture the cove is compressed to form between cauls in such a way that it retains the shape given to it by pressure. The nature of the material will be recognized by comparing it to the perforated veneers which are largely used for chair seats, chair backs, settees, &c., and its application to interior decoration will be appreciated by a large class among our readers. The construction being by transverse lamination of wood, a strength and durability is secured which is unequaled by any other material in use. The manufacturers direct attention to the fact that it cannot split, like the solid wood; neither will it warp, like wood bent to shape in single layers. We are informed that the cost of the veneer cornice is very little more than that of plaster cornice. The finish may be described as very tasteful, and the construction which has been employed is such that

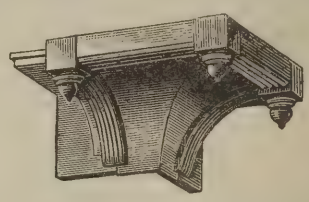


Fig. 9.—New Material for Interior Cornices. —Outside Miter.

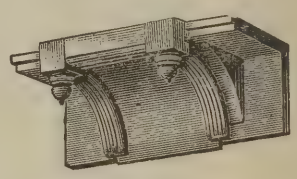


Fig. 10.—Joint Brackets.

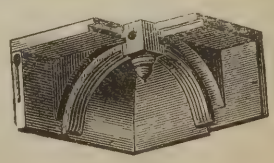
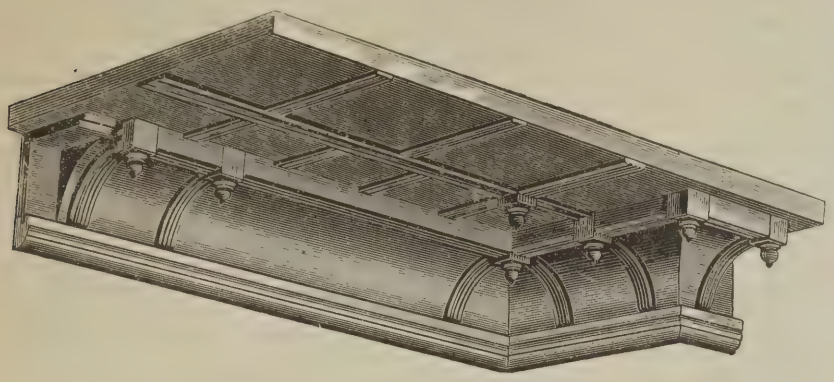


Fig. 11.—Inside Miter.

skilled mechanics are not necessary for putting it in place. Figs. 9, 10 and 11 of the engravings show respectively the construction of the outside miter, inside miter and what are termed joint brackets. Miters are



Novelties.—Fig. 12.—General View of Ceiling with Veneer Panels.

joined before shipment and put in the form shown in the cut. The parts are fastened to a thin board ready to be nailed to the wall. The joint brackets are put in place after the miters have been set, and the straight cove, being cut to proper lengths, is then slipped in between the moldings. The work is then completed by fixing in place the lower molding, as will be understood by reference to the sectional view in Fig. 13.

If the ceiling is to be paneled with veneer panels, a finish which is entirely appropriate, the moldings are put in place in the general manner shown in Fig. 12. Panels are then inserted, and a finish is made by covering the edges with small corner moldings. A considerable variety is possible in work of this kind. The cove and ceiling panels may be of light wood, and the moldings of dark wood, say of mahogany. Various woods are appropriate for panels, among which may be mentioned birch, oak and maple. For molding, mahogany, walnut, oak and ash are used, according to the taste of the owner of the building in which the work is employed. The effect is most artistic when a judicious combination is used and when the natural grain of the wood is shown. By reference to the sectional view it will be seen that the profile of the foot molding of the cornice is such as to constitute it a picture molding. This saves the necessity of a special molding or picture rail, and also

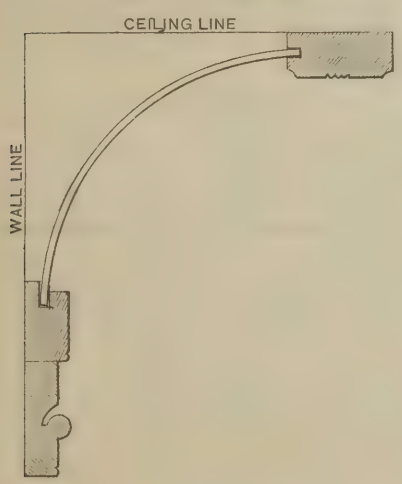


Fig. 13.—Section Through Cornice.

saves the necessity of breaking walls with the barbarous picture nails formerly in vogue. A number of important buildings in this city have recently been finished with this material.

The Attwell Burglar Proof Sash Lock.

Some months since we illustrated the Attwell sash lock and ventilator, and directed, attention to the merits which the makers the Attwell Mfg. Co., 357 Race street, Cincinnati, Ohio, claim for it. The lock has met with great favor by builders and architects, and in the use that has been made of it certain improvements have been suggested which have been recently incorporated. We are in receipt of a circular from the company illustrating the improved form in which the lock is manufactured, and which it is claimed overcomes all the difficulties which have been encountered with it in the past. As now made, application is very simple and easy, and it is adapted to all windows, whatever may be the peculiar style of construction. It works on either side and adjusts itself in one form to any variations in thickness of sash, parting beads, &c. It also has the merit of not interfering with inside blinds. The striking plate of the sash does

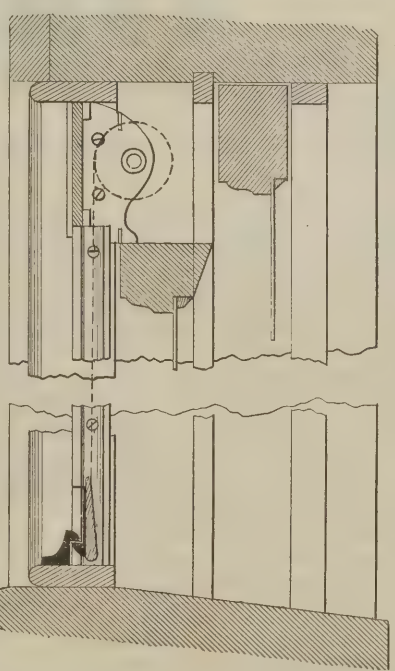


Fig. 14.—Vertical Section Through Screen Shown in Next Cut.

not touch the pulley in passing. It is possible to ventilate and safely lock the fixture without removing the key. In addition to this all the advantages possessed by the lock as originally made are retained.

Rolling Window Screens.

The Benedict Rolling Window Screen Company, of Asbury Park, N. J., are calling the attention of architects, builders and house owners to a rolling window screen which they have recently perfected. The general features of this device will be readily understood by examination of Figs. 14, 15 and 16 of the engravings and the following brief description: The screen is applied to a window in the same general manner as window shades are hung, using for the purpose a Hartshorn spring roller. The location of the roller is directly over the lower sash. Grooved strips, shown by the horizontal section, are placed against the window stops directly in front of the lower sash, and in the grooves thus provided the screen moves up and down, as required. The grooves make the screen tight at the edges as well as govern its course. The roller is concealed from view from the inside by a piece of wood which fastens against the upper stop, and which in shape and finish corresponds to the grooved pieces already mentioned. The natural spring of the screen causes it to press against this strip, thus making it tight at that point. The brackets on which the roller is hung form a stop to the upward

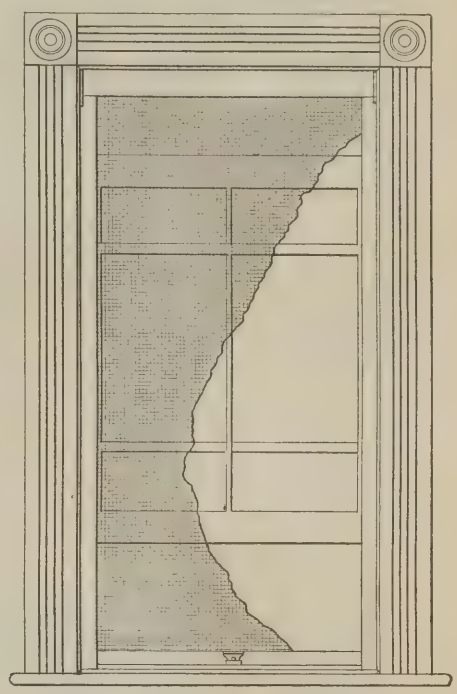


Fig. 15.—The Benedict Rolling Window Screen.

passage of the lower sash, and also make a finish to the ends of the grooved strips in which the screen moves. The material out of which the screen is made is a special article described as oil-print gauze, made of linen thread. It is thoroughly protected by paint, and is claimed by the manufacturers to be almost, if not quite, as durable as wire. The pliability of the material makes it possible to roll it up the same as an ordinary window shade. The screen is fastened at the bottom by a simple catch, indicated in the engraving, the spring to which is supplied by the elasticity of the stick that finishes the bottom of the screen. The protection against flies and mosquitoes afforded by this device seems to be complete, and it appears to meet all reasonable requirements. The upper and lower sash may be opened at one and the same time if desired, and the screen is readily got out of the

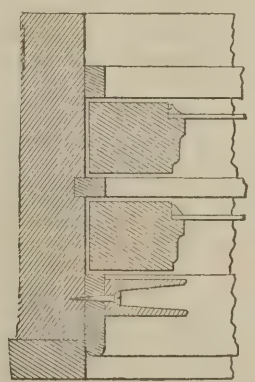


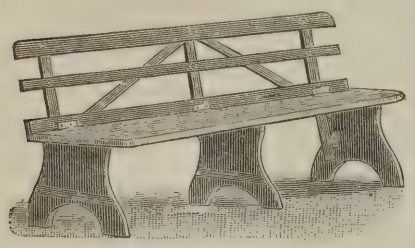
Fig. 16.—Horizontal Section, Showing Grooved Ways for the Screen.

way whenever it is necessary to do so for any purpose. There is no necessity of removing it from the window in the winter sea-

son, although it is as easily taken down as an ordinary shade if desired. The advantage of a screen covering the whole window will be generally appreciated.

Folding Seats.

There is always a demand for a convenient folding seat, which when not in use can be packed away in small compass, and which when not required can be opened out so as



Novelties.—Fig. 17.—Folding Seat, Open.

to form a convenient and comfortable resting place. Especially does this demand occur in connection with skating rinks, and also it exists to a greater or less extent with picnics, celebrations and the like, which take place in the warmer season of the year. In an endeavor to meet a well-defined demand which exists for seats of this kind, the Hamburgh Planing Mill Company, of Hamburgh, N. Y., have brought out the device shown in Figs. 17 and 18 of our engravings The first of these shows the seat as ready for use, and the second with the legs folded away and put in shape for storage. It will be seen that the seat folds into very small compass, and also that it is of good shape

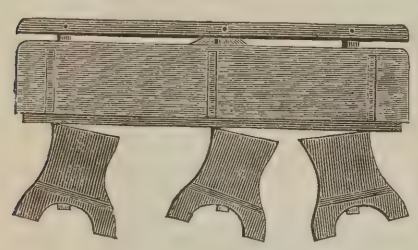


Fig. 18.—Folding Seat, Closed.

for use when opened. The special merits claimed for this device by the company are strength, durability, compactness and simplicity.

NEW PUBLICATIONS.

THE ARCHITECTS AND BUILDERS' POCKET-BOOK OF MENSURATION, GEOMETRY, &C., STRENGTH AND SUITABILITY OF FOUNDATION WALLS, BUTTRESSES, PIERS, ARCHES, POSTS, TRUSSES, FLOORS, ROOFS, &C.; in addition to which is a great amount of Condensed Information relating to Carpentry, Masonry and other Building Trades. Pocket size, 556 pages, illustrated, 408 engravings. By F. E. Kidder. Published by John Wiley & Sons. Price, $3.50.

The aim of the author in the preparation of this work has been to give architects and builders a reference book that should be for them what some of the most noted engineers' pocket-books have been to the engineering profession, namely, a compendium of practical facts, rules and tables, presented in a form as convenient for application as possible and as reliable as present knowledge will permit. The book, not being written for engineers, gives very little attention to some of the more intricate problems of building construction which may be fairly said to belong to the province of the engineer rather than of the architect and builder. The book has been modeled upon Trautwine's "Pocket-Book for Engineers," and that work has been imitated as well as the difference in the subjects would permit. The author has not hesitated to borrow and quote from many sources; hence his book is much more complete than would otherwise be possible. The volume is divided into three parts. The first of these treats of practical arithmetic, geometry and trigonometry, and presents rules, tables and problems. The second part contains 29 chapters devoted to rules and tables for determining the strength and stability of any piece of work that architects and builders may have in hand. Among the chapter headings in this portion of the book may be mentioned foundations; masonry walls; composition and resolution of forces; retaining walls; strength of masonry; stability of piers and buttresses; stability of arches; resistance to tension; strength of posts, struts and columns; bending moments; moments of inertia and resistance; principles of the strength of beams; strength of cast iron, wooden and stone beams; stiffness and deflection of beams; strength and stiffness of continuous girders; trussed beams; rivet and plate-iron girders; cast-iron arch girders; wooden floors; fireproof floors; metal construction; materials and methods of fireproof construction; wooden roof trusses, and iron roof trusses. The third part is devoted to rules, memoranda and tables useful in designing, estimating and building. This part of the work is embraced in something over 100 pages, and contains much useful matter.

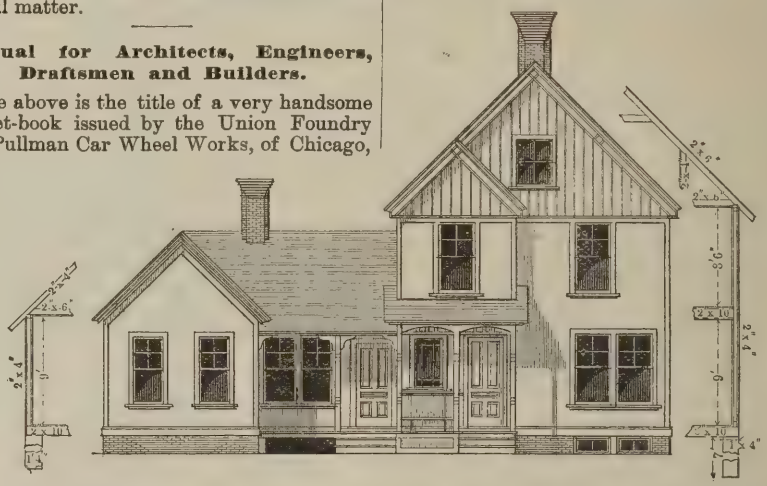
Manual for Architects, Engineers, Draftsmen and Builders.

The above is the title of a very handsome pocket-book issued by the Union Foundry and Pullman Car Wheel Works, of Chicago, for free distribution to applicants. The work has been prepared under the immediate supervision of Mr. C. W. Trowbridge, engineer for the company, and is a combination of practical facts and engineering formulæ that cannot fail to be of great value to the special classes addressed. Great pains have been taken in the extensive treatment of cast-iron construction which the work contains, and much matter is presented on this subject that is new and not obtainable elsewhere. There is a great deal in the book which would be very suitable for quotation in our columns, if we had space for the same, and that will be found specially serviceable to our readers who have calculations to make. A large number of tables are presented, among which are some showing the strength of cast lintels. In this a very rapidly-increasing factor of safety as the thickness of metal increases has been adopted. While this gives an awkward irregularity to the order of increase of strength incident to the increase of metal, it is the opinion of the author that the importance of the principle that thick castings are relatively weaker than thin ones justifies the peculiar means taken to give it prominence. The tables of strength of cast-iron columns are also from new formulæ. The tables of wrought-iron columns and struts are likewise comparatively new, and are based on the very highest modern authorities. The work reproduces much of the information usually found in rolling-mill handbooks and publications relating to fireproof construction. As already intimated, the collection of information is sufficient to make the book very valuable, and, since it is free to all applicants, it should be in the hands of every builder and architect.

CORRESPONDENCE.

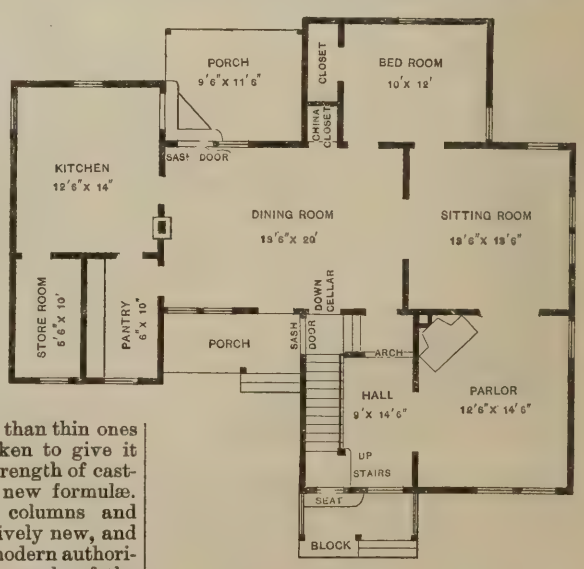
Farmhouse Plans.

From H. W. CASE, *South Bend, Ind.* —The intention in the erection of a building to the accompanying plans and elevations is to excavate only for the cellar under the main part of the house, giving vegetable and milk cellar, thus reducing the cost of the building. The drawings contemplate stone walls, but where stone cannot be readily obtained brick may be used to build the walls above the grade. In this case a 10-inch wall above the grade will answer. The frame is intended to be of the ordinary balloon character, using 6 x 10 inch sills and strong timbering, as indicated. If it is desired to finish the attic for additional room or for storage, 2 x 8 inch floor joists should be used in place of 2 x 6 inch. The gables of the main part of the house should



Front Elevation of Farmhouse, Designed by H. W. Case, South Bend, Ind.—Scale, $\frac{1}{16}$ Inch to Foot.

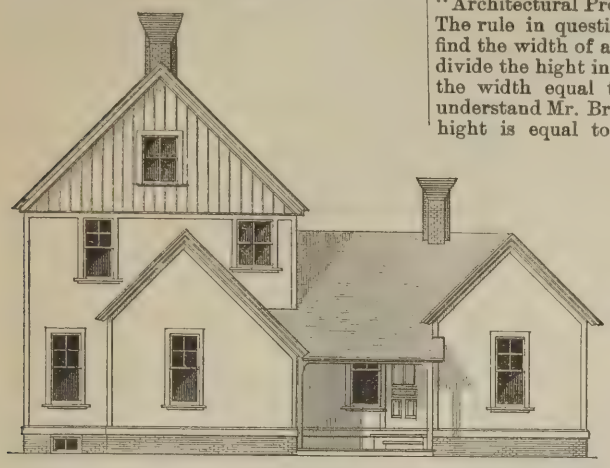
be sided by using 9-inch boards with battens, the remainder of the bnilding being sided in the ordinary way. Windows and doors are intended to be of regular sizes, such as may be readily obtained from dealers and planing mills. Special sizes and styles add considerably to the cost. The rooms are planned with special reference to the wants of a farmer's family. The dining-room, being most used, is centrally located and is made large. It opens upon both front and back porch, thus securing a good circulation of air in summer, with protection from the sun, The arrangement of the house contemplates



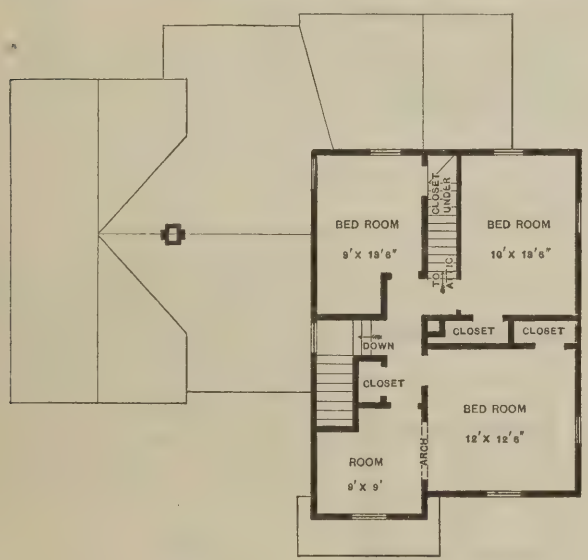
First Floor Plan.—Scale, $\frac{1}{16}$ Inch to Foot.

using this room in winter as a combined dining-room and kitchen. Openings into pantry and kitchen are so arranged as to be convenient for use as described. The kitchen may be finished as a summer

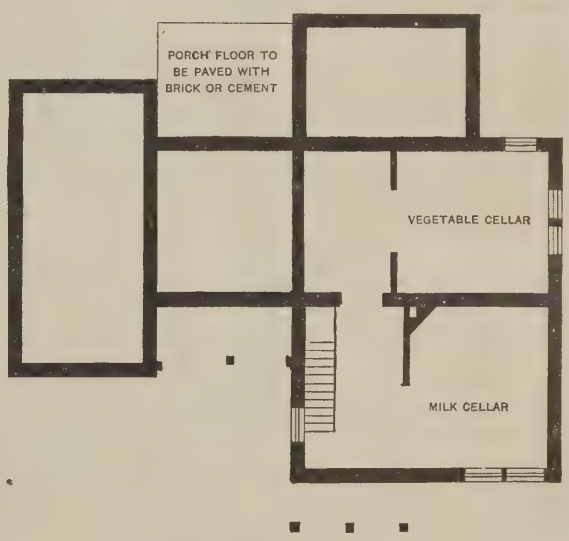
kitchen only, if that should be deemed desirable, thus reducing the cost of the house. The parlor, sitting-room, dining-room and hall may be all thrown together by folding doors, as shown. Ample pantry and closet room is provided, including a closet for each bedroom. The back porch floor is designed to be raised only 6 inches above the grade and to be paved with brick or cement. This porch will be found a convenient feature in any farmhouse, since pumps may be located in it to throw water to the barnyard or elsewhere, and in rainy weather or hot weather will be found very advantageous. No special details are thought to be necessary to the erection of this design. Simple moldings, readily obtained, are to be used. The inside finish may be very plain or it may be very elaborate, as is the taste of the one who is building. The front porch is intended to serve also as a horse-block, and there is located in it a seat. The front of the block and the back of the seat are finished with vertical wainscoting, 3 inches wide, beaded, as shown. The columns of the verandas, as presented in the sketches, are square, but turned posts may be substituted.



Farmhouse Plans.—Rear Elevation.—Scale, $\frac{1}{16}$ Inch to the Foot.



Second Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.



Foundation Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

Discoloration of Pine.

From A. H. F., *Charleston, S. C.*—Please explain to me why the white sap of yellow or pitch pine, unpainted, will turn a blackish blue when exposed to the weather.

Answer.—Without entering into a lengthy reply to this question, we may say that, as commonly explained among mechanics, the sap sours, and that in the chemical change that takes place the discoloration appears Perhaps some of our readers will improve this opportunity of answering an interesting question more at length

Architectural Proportion.

From J. E. C., *Vicksburg, Mich.*—Please give, through the columns of *Carpentry and Building*, an explanation of Rule 20, p. 29, of "Architectural Proportion," by A. J. Bryan. The rule in question reads as follows: "To find the width of any single door or window, divide the hight into 10 diameters and make the width equal to 4½ diameters." As I understand Mr. Bryan's system, the window hight is equal to the shaft of the column. This in turn is equal to 10 diameters. A door is equal in hight to base and shaft together, or is equal to 12 diameters and 45 minutes. From this I fail to understand how the author divides the hight into 10 diameters when a door contains 12¾ diameters.

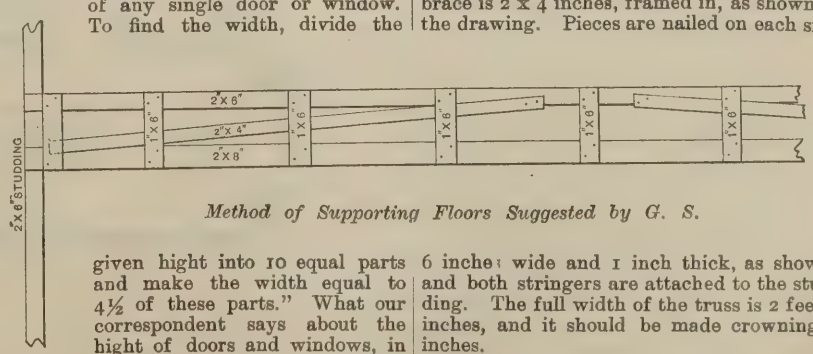
Answer.—We are not sufficiently informed with reference to Mr. Bryan's rules for architectural proportion to venture upon an unconditional defense of them. From casual examination, however, of the work, and of the particular points to which this correspondent directs attention, we believe that his difficulty lies not so much in a mistake of the author as a confusion of ideas in the mind of the reader. The rule referred to, as we understand it, is applicable for determining the width of opening for a door or window when the hight of the door or window, as the case may be, has been determined by other considerations. The rule is explicit on this point, and it seems to us can hardly be read in any other sense. It might be paraphrased as follows: "Given, the hight of any single door or window. To find the width, divide the given hight into 10 equal parts and make the width equal to 4½ of these parts." What our correspondent says about the hight of doors and windows, in comparison with the hight of columns, applies in determining the hight of those openings. All this is very fully explained in the early part of Mr. Bryan's book, while the rules from which the one quoted by our correspondent above is taken appear as a general summary in the latter part of the book, arranged for convenient use.

Architects' Plans.

From C. A., *Cambridgeport, Mass.*—I think the question of "architects' plans" should be further discussed. In the case of the architect whose letter was recently published, I would say that if the order was given to make the plans the contractor must pay for them whether they were taken out of the office or not. By your correspondent's statements it would seem that the order was given by the contractor, and that he called for the plans and retained them in his possession for several days. As I understand it the plans themselves are in all cases the property of the architect, and are to be returned to him after the building has been completed. If any copies of them are made, or if buildings are executed from them, I believe that the architect can recover I know several cases where parties have been pleased with buildings in process of erection, and have asked the contractor to build duplicates or to lend the plan. In one or two such cases the contractor has taken the parties to the architect and agreed with them upon a price for their use. In some cases the architect has allowed the contractor or the parties for whom the plans were originally made a discount on the price originally stipulated; in other words, the second use of the plans was at a less figure than the original use.

Supporting Floors.

From G. S., *Huron, D. T.*—In answer to "J. M. J.," I inclose a drawing illustrating a method which I think will be advantageous for him to employ in supporting the floors which he describes. It shows a method of trussing that can be done within a limited vertical space. The lower stringer is 2 x 8 inches and the upper one 2 x 6 inches. The brace is 2 x 4 inches, framed in, as shown in the drawing. Pieces are nailed on each side 6 inches wide and 1 inch thick, as shown, and both stringers are attached to the studding. The full width of the truss is 2 feet 6 inches, and it should be made crowning 2 inches.



Method of Supporting Floors Suggested by G. S.

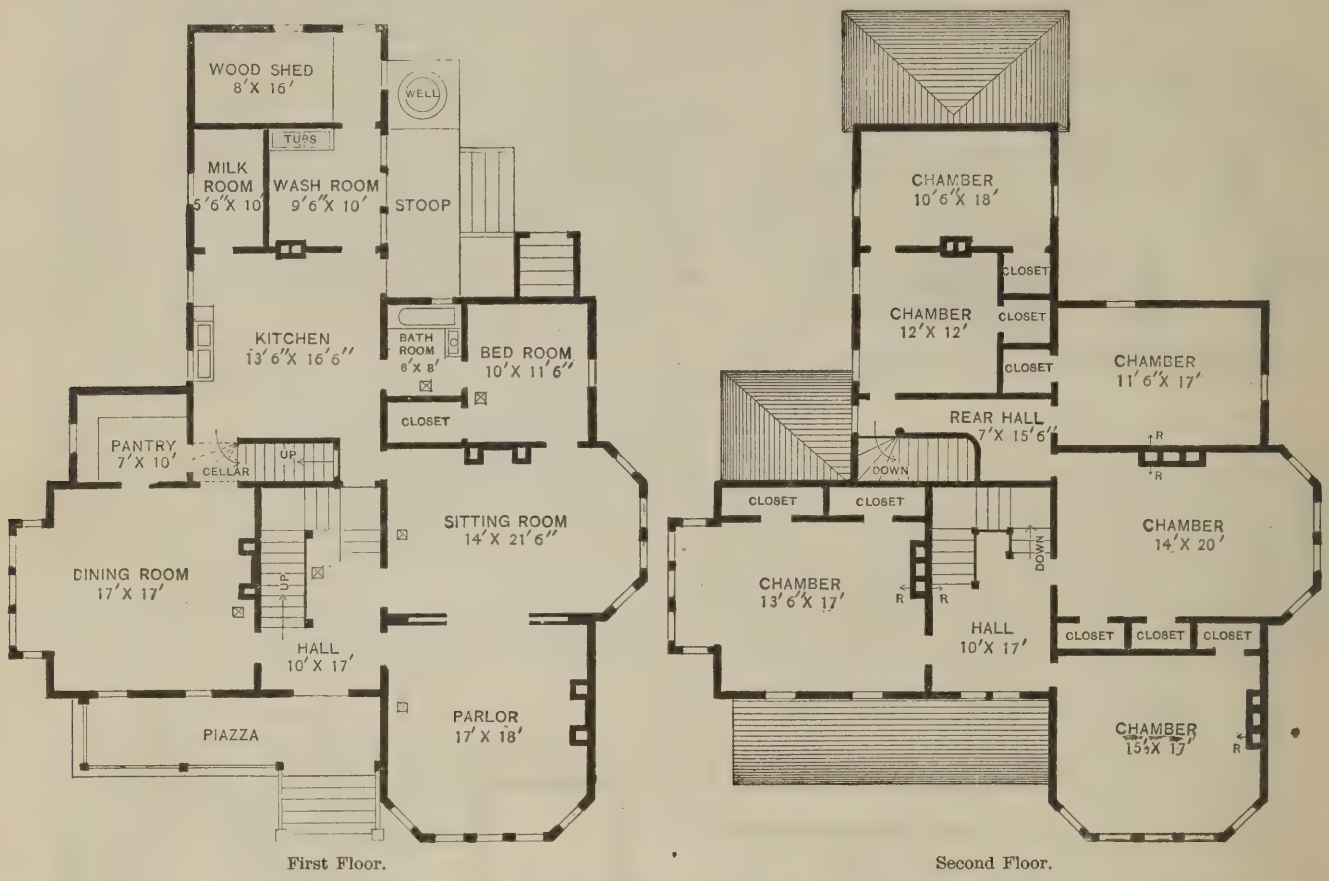
Sawdust Plastering.

From C. J. W., *Reed City, Mich.*—Sawdust plastering has been in use in France for over 20 years. It is the only plaster that will withstand successfully the gales blowing

from the Atlantic. Whether sawdust plastering is elastic enough to overcome the tendency of large halls to echo remains to be proven.

Another Farmhouse Plan.

From EDWARD PRATT, *Hanover, Mich.*—I send you the floor plans of a house that from long experience in building farmhouses I believe to be conveniently arranged for the requirements of a well-to-do farmer. The house is supposed to front the south, which brings the parlor, sitting-room and dining-room on the warmest and pleasantest side. The dining-room is located on the west side of the hall. This, I think, is a desirable arrangement, because it keeps the noise of the rough help more or less employed on a farm away from the other rooms. The bathroom is located so as to be convenient in getting hot water from the range boiler with but little piping, or, as would be the case in many farmhouses, it would be but a short distance to carry water from the kitchen-stove reservoir. Farmhouses are not usually located very near plumbers, and accordingly the less plumbing there is done beyond what is absolutely necessary the better. The cistern may be placed on the outside if preferred, but I have found no objection in locating it below a portion of the house. In this case it should be plastered overhead with a heavy coat of cement mortar.

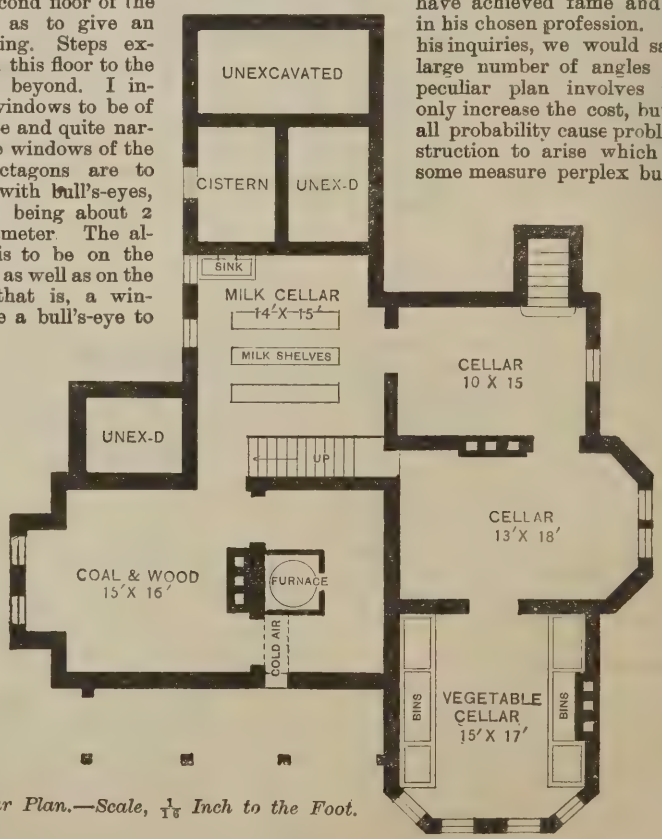


Floor Plans for a Farmhouse, Submitted by Edward Pratt, Hanover, Mich.—Scale, $\frac{1}{16}$ Inch to the Foot.

Curiosity in House Planning.

From R. C. A., *Preble, Ohio.*—I inclose you some sketches of a house which I contemplate building. I have spent my leisure hours in working out the plans. I submit them to you to learn whether such a building is practicable. I have had no experience in building, but take great interest in it and often wish I had studied architecture. I fear that the many angles in the proposed building may add largely to the expense comparing it with ordinary forms. I desire to inquire if there would be any unusual danger of the walls cracking. If you have any suggestions to offer or advice to give I shall be under obligations.

Referring to the ground plan, the room marked "Kitchen" is to be one story high, with shed roof. The portions marked "Library" and "Dining-room" are to be one and one-half stories in hight, with steep roofs. The portion of the house marked on the ground plan "Parlor" and "Chamber" is to be two stories in hight. Above the front veranda there is a small room which will serve as a landing from the stairs. This part is to be finished with a curved gable. This gable is to be of wood protected with tin shingles. The floor of the room above the front veranda is to be lower than the regular second floor of the house, so as to give an easy landing. Steps extend from this floor to the hall floor beyond. I intend the windows to be of single plate and quite narrow. The windows of the various octagons are to alternate with bull's-eyes, the latter being about 2 feet in diameter. The alternation is to be on the horizontal as well as on the vertical—that is, a window above a bull's-eye to be of regular pattern. The second-floor plan is self-explanatory. The water-tank for the bath room is to rest against the rear chimney. The roof plan shows my ideas of the covering of the building.



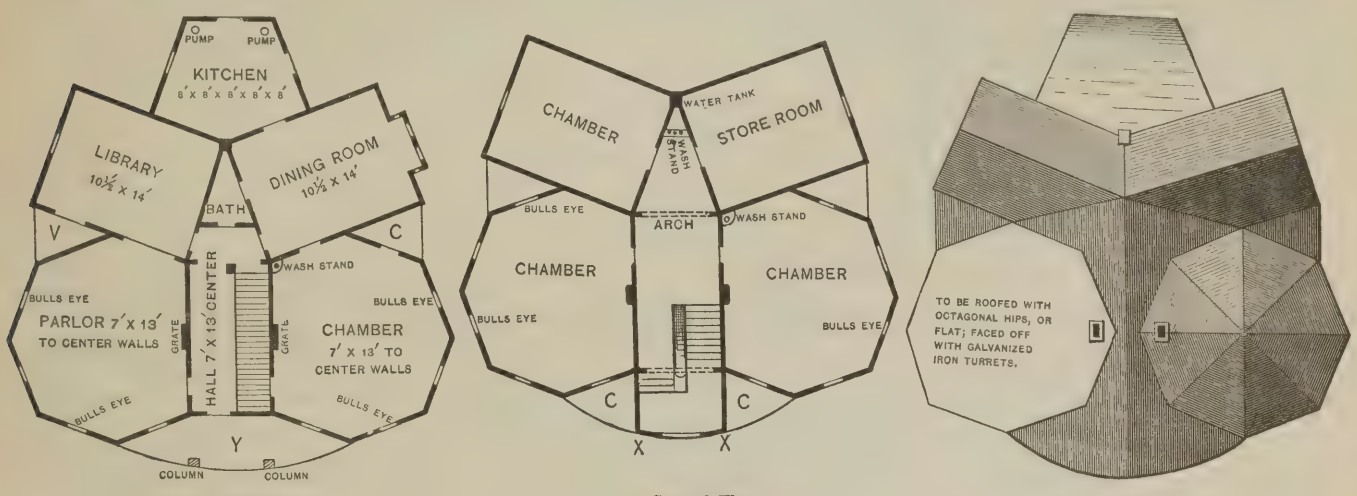
Cellar Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

Answer.—Our correspondent has presented a veritable curiosity in house planning, and we risk nothing in saying that if he had devoted his life to the study of architecture, as he regrets he has not done, and had put as much originality into all of his studies as he has in his amateurish efforts, as evidenced by the plans herewith presented, he would have achieved fame and distinction in his chosen profession. Answering his inquiries, we would say that the large number of angles which this peculiar plan involves would not only increase the cost, but would in all probability cause problems of construction to arise which would in some measure perplex builders who have had no experience outside of ordinary forms. A greater objection than this to the plan presented, however, is that

it would scarcely commend itself as a thing of beauty and a joy forever when finished. It so nearly encroaches upon the domain of the absurd that it might possibly be dubbed with a nickname that would seem much more appropriate in the minds of the general public than the title which its owner would bestow upon it. At least such has been the experience of others who have broken away from accepted lines of design and construction.

We will enter our correspondent's house, and, for the sake of criticising it intelligently, imagine that we are to live in it. Various objections are brought to light which no doubt have escaped the author's attention. While the shape of the parlor and the bedroom on the lower floor is sufficiently unique to please those who are fond of the irregular, the rooms are of a character to illy accommodate some of the furniture that is ordinarily placed in such apartments. They are both so poorly lighted, if we understand our correspondent's description of his narrow windows, alterrating with bull's-eyes, that they are the opposite of cheerful. There would be two of each of these kinds of windows to each room, which, being small, would be hardly sufficient. The three-cornered closet that is provided off of the bedroom, although apparently capacious, is of bad shape for holding many articles which are commonly kept in such places. The location of the bathroom at the back of the main hall on the first floor is bad on general principles. The fact that it is a dark room, with no possibility of light from any direction, and, so far as we can see, no provision for ventilation unless it be through a door into the dining-room or through another door into the front hall, is very bad. Entering a bath from either a dining-room or the principal hall of a house is something that most people would condemn unconditionally. We might criticise features on the second floor in a similar manner, but it is hardly necessary. The interest that our readers will find in this plan is in the general outline and shape of the rooms.

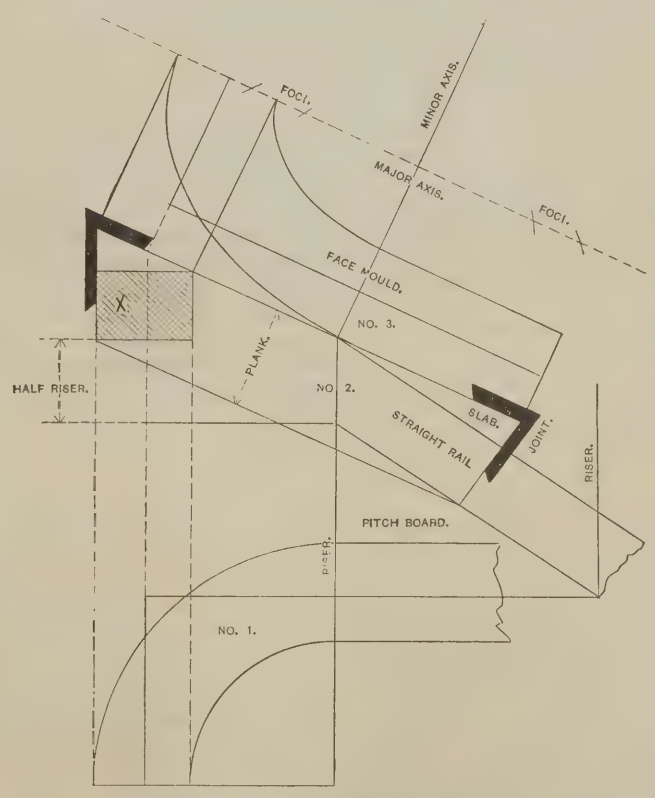
With reference to advice and suggestions, we can only say that in our opinion our correspondent will regret the outlay of money if he builds to a plan so much outside of the beaten track, and one which has not been in the first place carefully scrutinized and worked out by a competent architect or builder. We should advise adhering more closely to the conventional, even at the sacrifice of some of the pet ideas which he evidently holds. In this connection it may not be without interest to our correspondent and to our readers generally to see what a contemporary says on this subject. The following is an extract from a recent number of the *Studio*: Nothing, says our contemporary, adds so much to the cost of building as indulgence in whims. To set out deliberately to do a "queer," "fanciful"—or, as it is sometimes called, "original"—thing in building is always to incur unnecessary expense. If we look through the books that contain pictures of the architecture of all ages and nations we shall find that, without an exception, in the times all men of taste are agreed in calling the good times, the modes of building have been sensible, founded on the needs of the case, and that whatever may seem fanciful—the whole of what we call picturesque—when its charm has proved enduring, is the result of what we may call, in every case, in "accepting the situation." Nothing has been done in such instances for the sake of being picturesque. Good building, good ornament, never poses. In building, as a rule, every departure from the rectangular form is an added expense. One of the things impressed on the mind of a young man who goes into an architect's office to study the profession is that, if cost is to be considered, which it sometimes is, and sometimes is not, all excrescences and projections must be avoided. A rectangular house is the cheapest. Bay windows, porches, octagonal or circular, external ends to rooms,—all these things cost money, and it is by multiplying these features that the expenses of building are often made so great as to deter people from undertaking it, for, the things seem so small in themselves, it is not suspected what drains they are on the purse. If a good reason cannot be given for any so-called ornamental feature in a house, if it can not be shown that something worth while is to gained by making it, we may be reasonably sure that it is a fancy which will cost, as the country people say, more than it comes to. And in the greater number of cases nothing, even in looks, is gained by indulging the fancy.



Curiosity in House Planning.—Sketches Accompanying Inquiry from R. C. A.

Hand-Railing.

From W. G. P., *Toronto, Canada.*—I inclose a diagram showing a simple method of getting over the difficulty presented by your correspondent, "M. L, G.," in your December issue. I think the diagram needs but little explanation. The part marked number 1 is a part of the railing, with tangents. Number 2 is an elevation showing over pitch board the pitch of straight rail. X is the section of rail which is half a riser above the landing. From the lower corner of this rail there is drawn the line to which you decide to make the joint. A second line from the upper corner is drawn parallel to it, showing the thickness of plank required for the wreath-piece. It will be seen that the further the joint is from the spring the thicker the stuff will be required to be. The

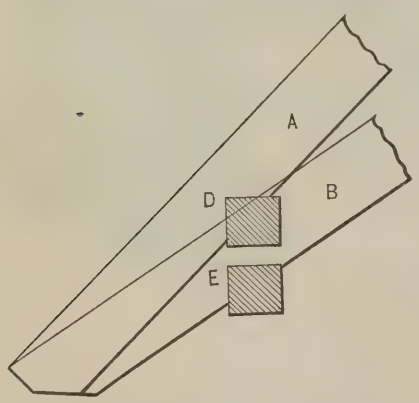


Problem in Hand-Railing.—Diagram Accompanying Letter from W. G. P.

two bevels are from the face of the plank. If the piece marked "slab" is taken off first, a square is all that is required to make the joint. Number 3 in the diagram is the face-mold, and tangents with the major and minor axes and foci, for striking the outside and inside curves of the mold. In conclusion, I will add that the face-mold of all stairs with level landings, no matter what size the well may be, can always be produced from the pitch-board if the risers are judiciously placed.

Valley Rafters.

From W. B. S., *Flemington, N. J.*—In the November number of *Carpentry and Building* "J. S. D." desires to know where on the face of the plate to locate the valley rafter, so that two roofs of unequal pitch will intersect on the center of it. A correspondent in the December number says that it will be necessary to put in two valleys. This has not been my experience. Inclosed I send two sketches of my way of doing such



Valley Rafters.—Fig. 1. *of Sketches Furnished by W. B. S.*

work. Fig. 1 shows the two different roofs, drawn so that they have the same projection and making the eaves level. It will be noticed that the plates are at different hights. The difference is from D to E, and in this case, where the steep roof is at an angle of 45°, the valley rafter will be located as far from the angle of the plates on the plate B as the difference in the hights of the plates. Another way of accomplishing the same result is to terminate the steep rafter at the plate and to spike a foot to it, making the piece so added of the same pitch as the flat roof. In this case the plates can be of the same hight, and the valley rafter will be

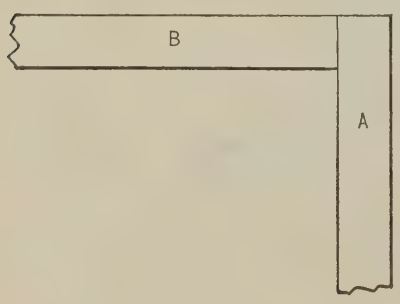
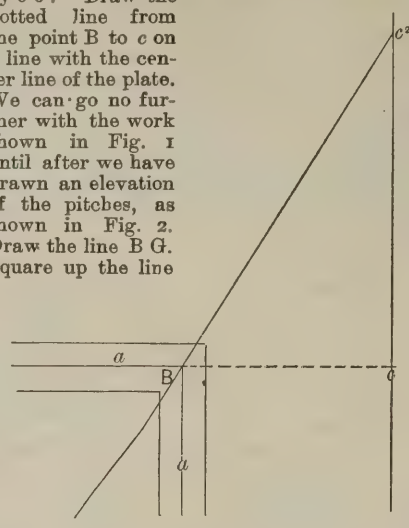


Fig. 2. *of Sketches by W. B. S.*

located directly in the angle of the plates. When the work is executed on this plan there is less difficulty in uniting the moldings in the angle.

From L. H. B., *Corning, N. Y.*—In the issue for November I find a request from "J. S. D.," for information concerning the method of locating a valley rafter when the two intersecting roofs are of different pitches. My solution to the problem presented is as follows: First determine the angle at which the rafter will stand when placed in position. Commence by making a diagram of the angle of the plate on which the rafter sets, as shown in Fig. 1. Draw the line *a a* in the center of the plate, and intersect at B, which is a fixed point. Draw the line parallel with one of the plates, and at half the width of the building from the face of the plate, and extend as indicated by *c* c^2. Draw the dotted line from the point B to *c* on a line with the center line of the plate. We can go no further with the work shown in Fig. 1 until after we have drawn an elevation of the pitches, as shown in Fig. 2. Draw the line B G. Square up the line



Valley Rafters.—Fig. 1 *of Diagrams from L. H. B.*

C D. Make C B equal to B C, Fig. 1. Draw the pitch line B D, which in this case is made a pitch of 45°, to correspond with the diagram originally submitted by the correspondent proposing the question. The point D determines the hight. The line D F is on the pitch of 8 inches to the foot, also to correspond with the original problem. Make *c* c^2, Fig. 1, equal to C F, Fig. 2. Then in Fig. 1 draw the line from c^2 to B, which will show the angle at which

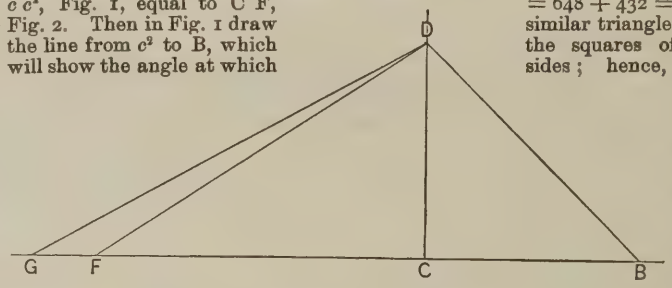


Fig. 2.—*Elevation of the Pitches.*

the rafter stands when placed in position. It also determines the point on the face of the plate where it should be placed. To determine the length make C G equal to B c^2, Fig. 1. Connect the points G and D, and the resulting line will be the length of the rafter. The perpendicular line on the rafter at H in Fig. 3 should be placed on the center line of the plate.

Improvised Clinch Nails.

From C. M. R., *Wheeling, W. Va.*—When a builder needs a few clinch nails and is too far away from the shop or a store where

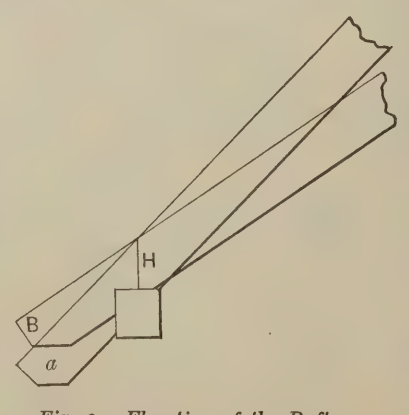


Fig. 3.—*Elevation of the Rafters.*

they can be procured to obtain them conveniently, it is well for him to remember that heating common cut nails to a low-red heat and allowing them to cool slowly will put them in a condition to bend almost as well as an ordinary clinch nail.

Note.—Our correspondent might have added that some of the steel nails which are now in the market, and which to all appearances are the same as the ordinary cut iron nails, are so tough or ductile that they can be used under ordinary circumstances the same as clinch nails. We do not know that the manufacturers specially claim this for them, but our own use of a few has demonstrated the point we make.

Dividing a Trapezoid.

From D. C., *Western University of Pennsylvania, Allegheny City, Pa.*—There are several solutions of the problem in board measure proposed by "W. B. M.," Brentwood, N. J., in the December number of

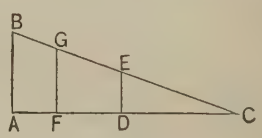


Fig. 1 *of Diagrams from D. C.*

Carpentry and Building, and there are three cases. First, when one of the angles of the trapezoid is a right angle, as at A in Fig. 1. We have given, A B = 24, D E = 12, A D = 72, to find F G and D F. Prolong the sides A D and B E to meet in some point, C. Let x = D C. Then from a property of similar triangles, $24 : x + 72 :: 12 : x$, whence $x = 72$ = D C. The area of the trapezoid A B D E = $(24 + 12)\,36 = 1296$. The area of the trapezoid D E F G = one-half of 1296 = 648. The area of the triangle C D E = $12 \times 36 = 432$. The area of the triangle C F G = $648 + 432 = 1080$. The areas of similar triangles are proportional to the squares of their homologous sides; hence, $432 : 1080 :: 12^2 : FG^2$, or F G = 18.974. Then in the triangles C F G and C D E, (D E) 12 : (D C) 72 :: (F G) 18.974 : (F C = 113.844). D F = F C − D C = 113.844 − 72 = 41.844. Proof: One-half of (18.974 + 12) × 41.844 = 648 = area of D E F G. Second, if none of the angles of the trapezoid is right then we may have the case where the line connecting the middle of the parallel sides is a line of symmetry, as in Fig. 2. The only difference in

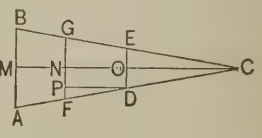


Fig. 2 *of Diagrams by D. C.*

this case is that F D in Fig. 1 will equal N O = P D in Fig. 2. P F = one-half of 18.974 − 6, and

$$FD = \sqrt{PD^2 + PF^2} = 41.989.$$

The third case is that in which the sides make unequal angles with the base. I don't understand "W. B. M" to include this case, and, therefore, will not trouble you to insert it.

From L. F. U., *Waco, Tex.*—In your issue of December I find the following problem presented for solution by "W. B. M., Brentwood, N. J.: "Divide a broad trapezoidal in form as follows: Length, 72 inches; width at thick end, 24 inches; at narrow end, 12 inches. The cut to divide into two equal parts, to be made parallel to the ends. Required, distance and demonstration.

Solution.—Let A B C D represent the given trapezoid. Then D C = 12, A B = 24 and B C = 72 inches. Produce A D and B C to a vertex at V.

Then V C : D C :: V B : B A,
or V C : 12 :: V C + 72 : 24,
whence V C = 72.

The area of the given trapezoid is 18×72. Then, by hypothesis, area C D E F $= 9 \times 72$, area $\triangle$ V C D $= 6 \times 72$, whence area $\triangle$ V E F $= 15 \times 72$. Since the area of similar triangles are to each other as the squares of their homologous sides, we have

area V C D : area V E F :: $\overline{V C}^2$: $\overline{V F}^2$,

or $6 \times 72 : 15 \times 72 :: (72)^2 : \overline{V F}^2$,

hence $2 : 5 :: (72)^2 : \overline{V F}^2$,

and $\overline{V F}^2 = (72)^2 \times \frac{5}{2}$, or $V F = 72 \sqrt{\frac{5}{2}}$.

$\therefore$ $V F - V C = C F = 72 \sqrt{\frac{5}{2}} - 72$

= distance from narrow end. From this we find $B F = 144 - 72 \sqrt{\frac{5}{2}}$, and $E F = 12 \sqrt{\frac{5}{2}}$.

From A. S., *Cincinnati, Ohio.*—In your issue of October 25, page 25, I find the following from "W. B. M.," Brentwood, N. J.: 'Divide a board trapezoidal in form and

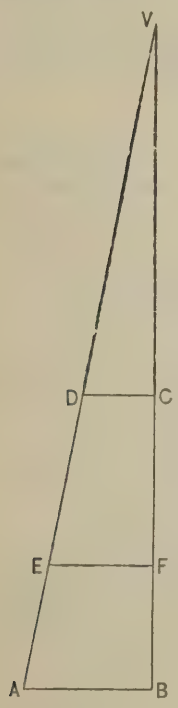


Diagram Accompanying Communication from L. F. U.

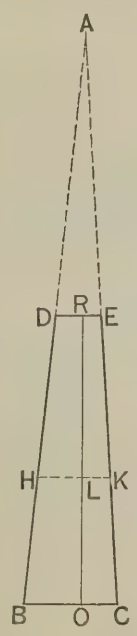


Diagram Accompanying A. S.'s Letter

dimensions as follows: Length, 72 inches; width at wide end, 24 inches; at narrow end, 12 inches. The cut, to divide into two equal parts, to be made parallel to the ends." Required, distance and denomination.

In the annexed diagram B D E C is the figure required. B C = 24 inches, D E = 12 inches, R O = 72 inches. We have the area of B D E C $= \frac{24 + 12}{2} \times 72 = 1296$ square inches, one-half of which, or 648 square inches, will be the area of B H K C, or H D E K, if, as I assume, the line H K is the one required. Continue the sides of the figure B D and E C until they meet at A, and, as they approach each other one-half the length of base in 72 inches, they will meet in 72 inches more. We will then have the triangle A B C, with altitude 144 inches; base, 24 inches; area, 1728 square inches. By the rule, similar triangles are to each other as the square of their homologous sides. We have A^2 B C : A H K :: $B C^2$: $H K^2$, or A B C : A B C − H B C K :: $B C^2$: $H K^2$, or 1728 : 1080 :: 576 : 360. As $H K^2 = 360$, $H K = \sqrt{360} = 18.9736$.

$$LO = \frac{648}{\frac{H K + B C}{2}} = \frac{648}{21.4868} = 30.158, \text{ and}$$

L R = 72 − 30.158 = 41.842, H K, the line required, being 18.9736 inches long, and distant from base 30.158 inches. Q. E. D.

Proof:

Area of figures H B C K $= \frac{24 + 18.9736}{2} \times 30.158 = 647.9989$

Area of figure D H K E $= \frac{12 + 18.9736}{2} \times 41.842 = 647.9986$

72.000 1295.9975

From O. B. C., *Philadelphia.*—I offer the following solution of the problem in board measure by "W. B. M.," of Brentwood,

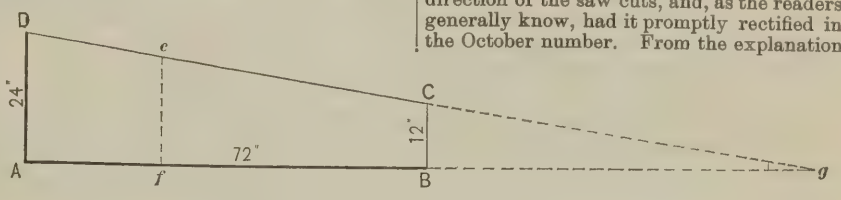


Diagram Accompanying Letter from O. B. C.

N. J., in December's issue. We will first continue the trapezoid A B C D to a triangle, A *g* D, as follows:

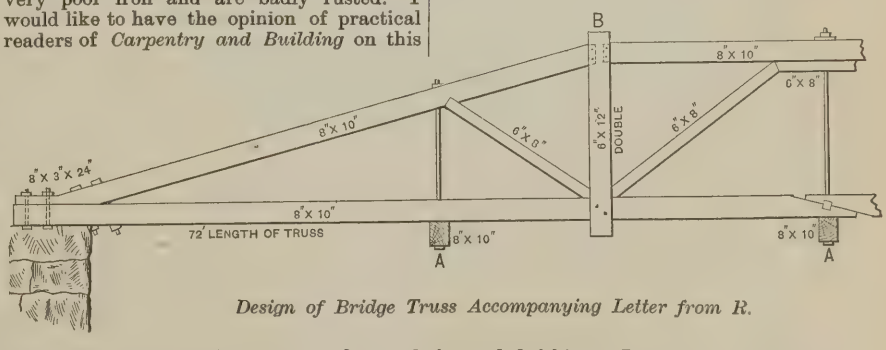
B C : A D :: A B, or 12 : 24 :: 72 = 144 = A *g*.

Then $\sqrt{}$ [A *g* D : *f g e* :: $\overline{A g}^2$] − B *g* = *f* B. Or

$\sqrt{}$ [1728 : 1080 :: 144^2] = 113.8419+ inches = *f g* 113.8419+ − 72 = 41.8419+ inches = *f* B.

Bridge Truss.

From R., *Lancaster, Pa.*—I desire to ask some questions about the bridge represented by the inclosed drawing. The bridge in question has been built about three years and is located in this neighborhood. It crosses a stream in two spans of 72 feet each. It was designed and built by a German carpenter for a farmer. I examined it a few days since and found it in a very bad condition. It springs like a piece of whalebone when a wagon crosses it, and it has sagged fully 3 inches in the center. The bridge is 12 feet wide between trusses. The stringers rest on the cross-ties or beams A. The floor consists of 2 inch plank nailed on the stringers. The braces butt against a block which is bolted to the chord with two bolts ¾ inch in diameter. The heel of the brace is also fastened to the chord with two bolts of the same size. At the joint B there are two pieces 6 x 12 inches, notched and bolted with two bolts at the top and bottom. There is only a common key splice in the center of the chord. The truss-rods seem to be of very poor iron and are badly rusted. I would like to have the opinion of practical readers of *Carpentry and Building* on this



Design of Bridge Truss Accompanying Letter from R.

truss. For my part I cannot understand how it has stood up as long as it has. The bridge that spanned the stream before this one was built broke down with a loaded team on it, and it seems to me that this one is likely to follow the same course.

Note.—Without entering into a critical discussion of this bridge, its general faults may be indicated by saying that the construction is inadequate, and there evidently has been a desire to save material. The design is one that might be made to work fairly well on a shorter span than that to which it has been applied. If any of our readers see fit to send sketches of better trusses adapted to the span named we shall take pleasure in publishing them.

Splayed Jambs.

From J. V. H. S., *New York City.*—In reference to the solution of the problem of splayed jambs submitted by "J. R. L.," I notice that in his recent communication he says that he sent the wrong diagram in the first place. This was published in the September number. I accept his statement, and, as he has since sent another diagram which he thinks will set things right, I feel at liberty to investigate it. He states that misery likes company, and proceeds to point out that "G. W. P.," in the August number, and "J. V. H. S.," in the September number, are at fault. I found my mistake as soon as the paper came to hand, in reference to the direction of the saw cuts, and, as the readers generally know, had it promptly rectified in the October number. From the explanation of "J. R. S.'s" last diagram, it appears to me he will have to try once again; he also is in error as regards the direction of the saw cuts. While he draws one foot out of the mire he puts the other in still deeper. It should be C H, not G H, equal to A E, to prove the correctness of the drawing. In reference to the saw cuts, which "P. W." carefully calculates with respect to length of the segment, I would say that if the length is taken at the back of the jamb, which is proper, it is positive, and when the face is sawed, so as to bend in place, the length on the outside or back will not be changed. This correspondent claims that the difference in length is 3 inches between the outside and inside, and that this 3 inches must be taken out of the larger circle in saw cuts in order to bend the jamb to the required shape. The saw cuts being on the face, the difference must be taken from the smaller circle. Now, as the saying is, we can all see the faults of others better than our own, and a little prodding did make me see my faults, as you see, and it has been of great benefit to me. I hope that "J. R. L." and "P. W." will take no offense from my remarks. Let us rather have an exchange of thought. I may be wrong as regards "P. W.," and, if so, shall be pleased be set right.

Sizes of Timber.

From N., *Chicago, Ill.*—I should be very glad if some one would give me a list of the sizes of timber in the rough used in joinery, and what is generally taken off in planing and finishing. I am often puzzled about the specification on drawings in an effort to ascertain the correct size and thickness.

Answer.—If our correspondent should visit some of the large lumber yards in Chicago he would be astonished, perhaps, to learn that almost every conceivable size of timber, within certain limits, is used in framing buildings. Some sizes, of course, are far more commonly employed than others, but there seems to be a place for every timber made, no matter what its exact proportions may be. As to the amount taken off of timber in dressing and getting it into fit shape for use, it is hard to give an invariable rule. In some cases the reduction is very slight, and in others it amounts to much more. If

our readers see fit to answer this correspondent upon this point we shall take pleasure in publishing their letters. So far as we are acquainted with the habits of architects in specifying timber, we think, as a rule, they give the net sizes upon their drawings, expecting that enough larger timber will be employed to furnish the net sizes named after dressing. However, there is so little difference between the two as to make the matter comparatively unimportant.

REFERRED TO OUR READERS.

Kiln-Dry.

From S. T. T., *Sacramento, Cal.*—Will some reader of the paper please give me an elevation, floor plan and cross-section, drawn to scale, of a kiln-dry, showing the construction and also illustrating the ways of managing the same. I would like in the same connection to be informed how much lumber it is practical to dry at one time in apparatus of this kind, and how long it takes to dry it. Let it be assumed that the material is soft pine, 2 x 3 inches. I have all the numbers of *Carpentry and Building* so far published, and from careful search through the volumes I find several inquiries about kiln-drying, and only one short article on the subject, and that describes somebody's patent apparatus, all very good in its way, but it does not give a person not skilled in building kilns or drying lumber the information he needs.

Note.—What our correspondent requests above is of interest to a very large class of our readers, and we shall be glad to have communications upon the subject. If this should chance to reach any person specially skilled in the line indicated, and who for a consideration would be willing to get up an article relative to the general subject of drying lumber by artificial means, accompanied by sketches, we shall be pleased to have him communicate with us. In the meantime, those records of practical experience which our readers may send in will find a place in our columns.

Resawing Pine Boards.

From A. H. F., *Charleston, S. C.*—I desire to inquire the cause of a certain phenomenon which I have often witnessed. In resawing white-pine boards with a circular saw that is not large enough to go through at one operation, the saw is liable to bind, being pinched at the lower edges of the two boards that are being cut. After the board has been cut through by resawing and sawing from the other side the two pieces assume a curved shape. I desire to inquire of practical readers of the paper why this is so.

Driers for Inside Work.

From S. A. M., *Stewart's Mills, Texas.*—I desire to inquire of the practical readers of *Carpentry and Building* if a drier should be used on inside work? A job of painting has been done in this vicinity by men said to be first-class in their trade. The outside work dries in a very few days, while the inside work does not dry at all, apparently. The material used is claimed to be strictly pure white lead and boiled linseed oil. If some reader of the paper will answer this question he will confer a favor?

Damp Walls.

From W. A. W., *Fort Smith, Ark.*—Will some practical reader of *Carpentry and Building* give me a remedy for damp walls? I have charge of a three-story brick hotel built partly of hand-molded and partly of brick pressed with a hand machine. Some of the rooms in the second and third stories become very damp at times, while the first story and cellar show no signs of dampness. All the rooms that show dampness are built of pressed brick, while none of the rooms built of hand-molded brick show any signs of it. Some of the pressed brick in turn show no indications of dampness. The outside walls are painted throughout with three coats of zinc and oil, with color. The building fronts southwest. The rooms facing northwest, north and east are the ones most affected. In this climate, during the latter part of winter and early spring, we frequently have a great deal of rain and damp weather. At such times the paper in the rooms mentioned is affected to such an extent that it comes loose from the walls. The walls are built solid, 13 inches thick, with two coats of brown mortar, with hard finish on the inside.

Grocery Store Fittings.

From W. J. F., *Augusta, Ga.*—I shall be glad to see published in *Carpentry and Building* some good designs of counters, shelving and bins suitable for a fancy grocery store. What I desire is the best arrangement and design in use for this purpose.

Problem in Hand-Railing.

From W. W. P., *East Fairfield, Ohio.*—I desire to ask "W. G. B.," through the columns of *Carpentry and Building*, to kindly present for the benefit of the readers of that journal his method for obtaining wreath over cylinder in platform stairs.

Yellow Ocher and Spanish White.

From J. W. C., *Elk Lick, Pa.*—I have a question in painting which I desire to refer to practical painters who may be readers of *Carpentry and Building* I have been told that yellow ocher and Spanish white mixed with linseed oil and lubricating oil, or "black strap," as it is called here, half and half, is equal to lead for priming. I often use this mixture, omitting the black strap. I have doubts of this ingredient being of any merit in the paint. Will practical men give me their opinion as to the value of the mixture above named in comparison with lead and oil?

TRADE PUBLICATIONS.

Perforated Veneer.

The catalogue of Gardner, Holmes & Co., No. 183 Canal street, New York, manufacturers of perforated veneer, contains many illustrations of the usefulness of this material, which has come into very general employment in various directions. It was a short time ago, comparatively, when a chair seat of this material was a novelty, and whenever seen was carefully examined. At first the work was limited to small pieces. At present it is used not only for chair seats, but also for chair backs, and in many instances the seat and back are in one piece. The same material is used for car seats, for settees, for seats in Sunday-schools, street cars and in various other places. The applications which have been found for this material are far more numerous than would be supposed at the outset. The catalogue before us, which contains some 75 pages, is profusely illustrated, showing various applications, as well as illustrating many goods of which this material is a component part. The material is of interest to architects and builders on account of its cleanliness, lightness, durability and other excellent features. The perforated veneer may be described as three-ply work. Three thicknesses of wood are used and the direction of the grain is reversed. The perforations add much to the desirability of the material for chair work, and make it a strong competitor of cane, rattan and other materials. The catalogue before us has a very large collection of chair designs, as well as showing some of the special applications above mentioned.

Wood Split Pulleys.

Wood split pulleys, wood bushings, pulley racks, wood-screw belt clamps, hand-screws, &c., are treated in an interesting manner in a catalogue recently sent out by the Dodge Manufacturing Company, of Mishawaka, Ind. Special attention is given to what is known as the Dodge "Independence" wood split pulley, and results are published to show its superiority over other pulleys now in the market. Engravings also are supplied enabling intending purchasers to form a good idea of its construction. In addition to the descriptions the catalogue contains the usual price lists, testimonials, &c.

TRADE NOTES.

We are indebted to Mr. Alexander Miller, of Washington, D. C., for a copy of his lithograph showing the top of the Washington Monument, with the scaffolding, derricks, &c., employed in setting the cap-stone, an account of which we published a short time since. This general subject has been variously treated by the artists of the popular illustrated papers, but in all the pictures we have seen there has been a lack of mechanical detail that has made the views very unsatisfactory to mechanical readers. What was lacking in these is fully supplied by Mr. Miller's drawing. Considerable spirit has been infused into the sketch, and one appreciates the immense hight of the work by the very position in which the several figures are represented. The time chosen by the delineator is the moment when the American flag was in process of hoisting to the masthead. These lithographs, we understand, will be very generally distributed through the trade, so that those who are interested in the general subject will have no difficulty in procuring copies.

What is said to be the largest room in the city of Buffalo, under a single roof and unbroken by columns, is in the new State Arsenal, located on Broadway, in that city. The room referred to is 276 feet long and 179 feet wide. The largest room of the kind in the world is said to be at St. Petersburg. This measures 620 feet long and is 150 feet wide. It is used for military drill, and it is said a battalion can maneuver in it. The St. Petersburg room is lighted by 20,000 tapers. In contrast with this it may be mentioned that the Buffalo room is lighted by 15 electric lights, in connection with the same number of Frink's reflectors. It is safe to say that the American room is far the best lighted of the two, and that not a little of the brilliancy of the apartment is due to the reflectors employed.

Brobst & Neumeyer, Macungie, Pa., whose window stop fastener we illustrated a few months since, inform us that they have recently modified the head of the fastener so as to make it more convenient for grasping in the fingers for operating. We understand that they are building up a very desirable trade in this specialty.

We have received from Messrs. W. Walker & Sons, 119 Bunnhill Row, London, England, pamphlets relating to their manufactures. One of these is an oblong, 11 x 14½ inches, with full-page plates of interiors, showing decorations and furnishings. Each of these plates is faced by descriptive text and quotations of prices. The individual articles shown in the plates are numbered, and these numbers appear in the list, thus giving the prices per piece. The second pamphlet is devoted to wood chimney pieces, and contains many designs that are of value to architects and designers.

James G. Wilson, of No. 527 West Twenty-second street, New York, has issued a new edition of his catalogue of rolling blinds, which is being sent to all applicants and the trade in general. The pamphlet contains a number of engravings showing the construction of the blinds in a very satisfactory manner, and contains numerous testimonials from those who have them in use. We have also received a copy of the special circular which Mr. Wilson is distributing at the New Orleans Exposition. It is printed in three colors and is very attractive.

We learn that the copartnership existing for some years past between Stephen A. Morse, Carlton M. Williams and Edwin F. Morse, under the firm name of Clem & Morse, of Philadelphia, will hereafter be conducted by the same partners under the firm name of Morse, Williams & Co. Mr. S. A. Morse will superintend the mechanical and manufacturing departments, Mr. Williams the books and finances, and Mr. E. F. Morse the contracting and erection of work, as heretofore.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME VII. NEW YORK=APRIL, 1885. NUMBER 4

A Cheap Frame House.

The accompanying design of a cheap frame house was prepared by Mr. Alexander Millar, 317 Thirteenth street, S. W., Washington, D. C. Unlike most of the details presented in this journal, those given herewith have been photo-engraved direct from the author's originals, and the cleanness of the lines and the general excellence of the work show in a marked manner the draftsmanship of our contributor. The elevations and plans have been re-engraved, and are perhaps less satisfactory than they would have been if made also from the author's originals. From a brief description of the house furnished us by Mr. Millar we gain the following particulars: The cellar is intended to extend under kitchen and stairs only. The frame of the building is intended to be of the style known as balloon framing. Rosin-sized building paper under the clapboards is to be depended upon for tightness and warmth. If erected in the neighborhood of Washington the author would use Virginia pine, which is a relatively cheap material in that market. The exterior is very plain, and the drawings clearly show the parts of which it is composed. The house is planned with regard to privacy as well as convenience. The stairs are separated from the entry by an arch, across which a curtain may be hung. The kitchen is provided with two closets, the lower part of the one located between it and the living-room being for the accommodation of stove ware. The upper part of this closet opens into the living-room, thus giving that apartment the advantage of a convenient storing place. Access to the cellar from the kitchen is had by a stairway under the main stairs of the house. The low window shown in the end elevation lights and ventilates the cellar stairway. The living-room is of ample dimensions. The window in the side of this room is located at such a hight as to admit of a mantel under it. The second story is divided into three rooms, each of which is provided with a closet. A large closet is also provided on the second floor, opening out of the hall, which may be used as a storeroom. The estimated cost of a house to this design, plainly finished, is in the neighborhood of $800.

A CHEAP FRAME HOUSE, DESIGNED BY ALEXANDER MILLAR, WASHINGTON, D. C.

R. W. Edis, writing on the subject of terra-cotta, says: "So far as my experience goes, the public generally are unaware of the real advantages and merits of terra-cotta for facing street fronts. When properly burned, it is absolutely impervious to smoke, and is unaffected by acid fumes of any description; it is about half the weight of the lightest building stones, and its resistance, when burned in solid blocks in compression, is nearly one-third greater than that of Portland stone; it is not absorbent—a great desideratum when damp has to be considered; it is easily molded into any shape for strings, cornices or window-sills and architraves, and can be easily modeled for figure or other enrichment. It can be got in good warm yellow or red color, and, when glazed, can be produced in almost any tones of soft browns, greens, reds or yellows; and its strength, durability and imperviousness to all the destructive influences of town atmospheres, to my mind, recommend it as the building material most adapted for facing street frontages."

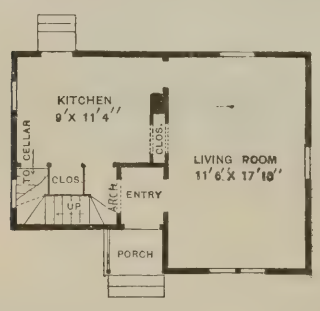
NOTES AND COMMENTS.

One of those commendable efforts which are put forth occasionally for the purpose of interesting young people in study and stimulating the ambition of apprentices and mechanics has recently been instituted in Brooklyn. An association has been formed by several young men, formerly scholars of the Evening High School, the object of which is to continue the study of architectural, mechanical and free-hand drawing. For a name they have adopted the somewhat appropriate title of "The Pencil." The sessions of the class are six evenings each week, from 7.45 p. m. to 9.30 p. m. The instructors are Profs. P. Winter and D. Petri Palmedo. The former teaches free-hand and perspective drawing and the latter mechanical and architectural drawing. This association seems to present an excellent opportunity for persons engaged in the building or mechanical trades to study art drawing and to improve their time advantageously. We understand that the expenses of membership are merely nominal. The assessments are only enough to defray the necessary expenses, which are very small,

since the instructors give their services gratis. The president of the association is Thomas W. Bunting. The meetings are held in Room 56 of the Hamilton Building, 44 Court street.

It must be anything but satisfactory to conscientious and painstaking builders to be informed that nearly half of all the fires that occur are due to defective construction for which the craft at large are responsible. In a paper read before the Academy of Sciences, in its recent meeting at Des Moines, Iowa, Mr. W. F. Hackney, architect of that city, declared this to be a fact. He pointed out that at least 37 per cent. of the fires annually occurring might be avoided by such slight changes in building construction as requiring all flues to be built upon a firm foundation resting upon the ground, and having walls made of not less than two bricks or 9 inches in thickness. What he pointed out as being a still better style of construction is to line the chimneys with burned-clay flue lining, which at the present time can be obtained at very reasonable cost, and incase it in a wall 4 inches or one brick in thickness, made of good building brick, and having the joints well filled with mortar. Our fires occur from small defects in apparently unimportant details, and the large annual loss which the country sustains from this cause should induce greater care in construction and closer supervision upon the part of owners and superintendents.

A Cheap Frame House.—Front Elevation.—Scale, ⅛ Inch to the Foot.

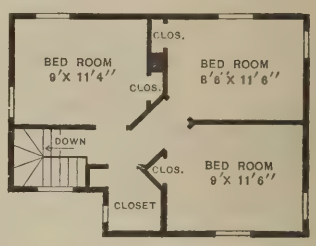


First Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

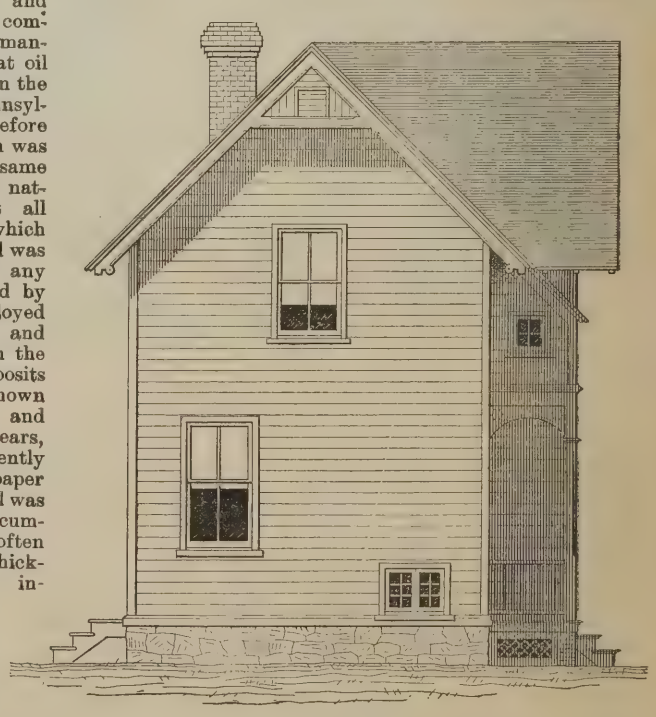
Steps have been taken to form a State association of architects for Missouri. The objects in view are mutual acquaintance, council and encouragement. A circular has been issued calling for a meeting at the rooms of the St. Louis Institute of Architects, St. Louis, for the 29th day of March. The objects of the convention will be primarily to establish a permanent organization among the architects of Missouri similar to those which have already been formed in the States of Iowa, Illinois and Minnesota, and to take such other steps as may seem advisable to elevate the profession and practice of architecture in Missouri. There is also in view as an object to secure admission to the Western Association of Architects, recently formed in Chicago. The circular bears the signature of a number of the most prominent architects of St. Louis, including the name of Charles E. Illsley, president of the Western Association of Architects.

From time to time certain natural resources which were previously unknown, or at least were unvalued, are made tributary to modern progress and add not a little to the comfort and welfare of mankind. It is a fact that oil was known to exist in the famous regions of Pennsylvania many years before the value of petroleum was discovered. In the same way the presence of natural gas throughout all that vast region in which it is now being utilized was known long before any method was invented by which it could be employed for manufacturing and domestic purposes. In the same manner vast deposits of moss have been known to exist in Norway and Sweden for many years, but it was only recently that their value as a paper and millboard material was discovered. These accumulations are said to be often more than a foot in thickness, and in many instances are half decomposed. The resulting paper and millboard is described as being as hard as wood, and it is said that blocks formed of it by the hydraulic press may be turned in the lathe and polished. The substance is said, further, to possess the good qualities of wood, without the defects of warping and splitting, and, accordingly, is suitable for many uses. Considerable money has recently been invested in Sweden in the way of machinery and appliances for working up these deposits of a hitherto waste substance into a useful material.

The question of the means to be employed in deadening floors very frequently comes up for consideration. The transmission of sound between rooms in contiguous stories of a building is oftentimes very annoying. As the power of a solid body to transmit sound is in proportion to its density, it becomes a very easy matter to correct difficulties of the kind named. To do this satisfactorily, however, the work must be undertaken at the time the building is being constructed. A *résumé* of the methods in common use will prove of interest. In enumerating them we shall state briefly their advantages and disadvantages. The old and primitive method of depositing a quantity of wet mortar on rough boards between the floor beams, &c., has in many cases been a cure quite as bad as the disease. The transmission of sound was lessened in a degree, but the dampness of the mortar was absorbed by the contiguous lumber, and sooner or later produced decay—dry rot. The use of sawdust is only a palliation, for it is likely after a time to absorb dampness and be reluctant to part with it. It also furnishes rats and mice a splendid material for nesting. Wool felt is an enduring, elastic material, and, when laid in strips equal to the width and top of the floor beams, the flooring, when laid, is uniformly separated from the direct sound conductors to the story below. Use the felt in thickness ¼ to ⅓ inch. The method of interposing a layer of mineral wool between the under and upper floors is a good one. On top of the first floor, narrow strips, 2 x 2 inches, are placed 16 to 20 inches apart, and the immediate spaces filled with mineral wool, placed in loosely—not packed—and the layer of floor nailed in position. By this method a warm, muffled and partially fire-



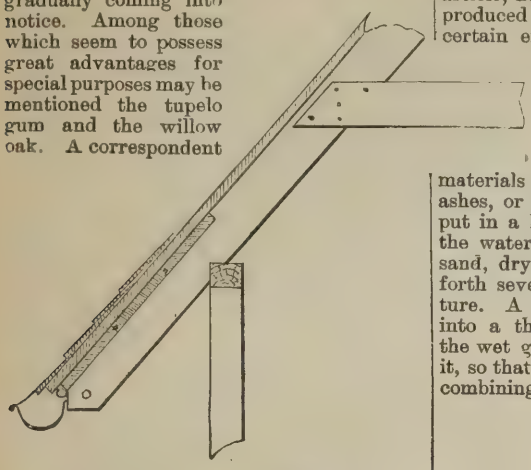
Second Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.



Side Elevation.—Scale, ⅛ Inch to the Foot.

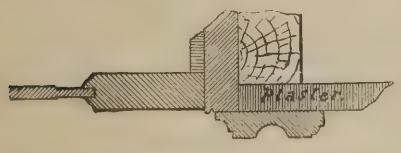
proof floor is secured, with ut the use of materials to produce dry rot or become the nesting place for vermin.

The merits of some of thee woods which are to be found in the Southern States are gradually coming into notice. Among those which seem to possess great advantages for special purposes may be mentioned the tupelo gum and the willow oak. A correspondent



A Cheap Frame Honse.—Section Through Eaves.—Scale, ½ Inch to the Foot.

who has tested these woods thoroughly says that the first variety is almost as soft as the cork of commerce, and is among the whitest of woods. It is extremely light and cannot be split, while at the same time it is very tough and tenacious and will bear a heavy strain. It would seem, therefore, very desirable for use in buckets, bowls, pitchers and other kinds of water vessels, and also for ox-yokes and in various other directions. This wood is described as growing among large cypress trees, and is said to be very abundant. The water oak, or willow oak, as it is more generally called, is described as being second only to the live oak, and is almost evergreen It requires the coldest water to make it shed its leaves, and when it is seasoned it is almost as hard as live oak. It is said to be very advantageous for use for the rims and spokes of wheels, and in shipbuilding it is no mean competitor of live oak. At present this wood has no market value, but it is probable that its merits will soon make a market for it.



Section Through Door and Trimming.—Scale, 2 Inches to the Foot.

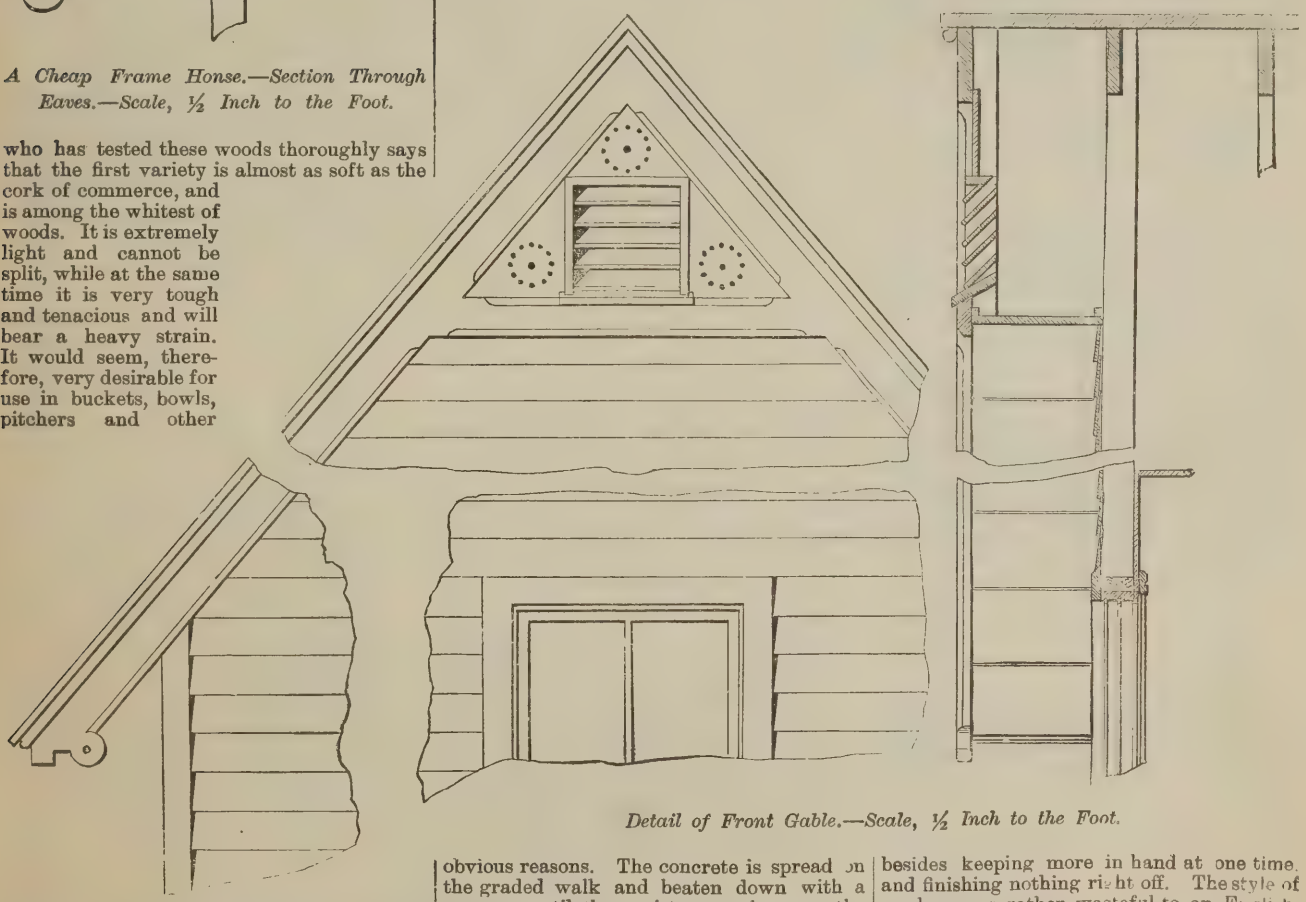
Our correspondents occasionally ask us questions concerning the production of concrete walks. To obtain the very best kind of work of this description some little skill is necessary, and there is also required the use of good material. A fairly serviceable article, however, we are persuaded, can be produced without any great skill, and to a certain extent waste material may be utilized in its construction. One of our exchanges credits an engineer with the following plan by which a concrete walk is produced, requiring no previous experience in preparing the materials. The materials used are water, lime and gravel or ashes, or both. The gravel and ashes are put in a heap and wetted One barrel of the water-lime is mixed with sharp, clean sand, dry, being shoveled over back and forth several times to get a thorough mixture. A portion is then mixed with water into a thin, soft mortar, and five parts of the wet gravel or ashes are well mixed with it, so that every fragment is coated with the combining mortar. This is important for obvious reasons. The concrete is spread on the graded walk and beaten down with a rammer until the moisture gathers on the surface; some of the dry sand or cement is then scattered over the surface to absorb the moisture, and the surface is smoothed over with a plank rubber having a sloping handle to work it back and forth. In a few days this is hard, and it becomes harder with time. By making divisions of thin strips of wood or tarred paper the cement may be laid down in blocks, squares or diamond-shaped, and for extra good walks the blocks may be colored by mixing the finishing coat with brown or gray or other colors alternately.

Base Board.—Scale, 2 Inches to the Foot.

Among the new inventions brought out on the Pacific Coast is a stirrup for supporting centers in the construction of arched floors, &c., which is being introduced by Charles Ackerson, of San Francisco. The stirrup is of such a shape as to hook on to the flange of an I-beam for supporting the center while the masonry is being done. It is easily taken out of position so as to release the center after the brick work is finished. By its use it is claimed that all studding and timbering is dispensed with, thus saving the cost of the stirrups on a single job. We understand that Mr. Ackerson proposes to sell the stirrups or to rent them, as may be desired.

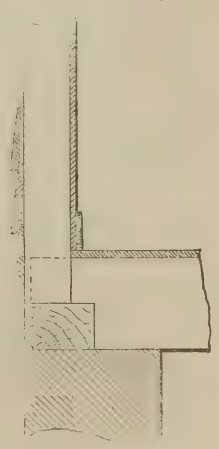
Plasterers' Work in Paris.

The French artisan has less changes of material than either the English or the American. While the English mechanic has many different cements to work with, the Frenchman, says Mr. Bartlett, has very few indeed, mainly working in that plentiful material plaster (gypsum or sulphate of lime), the coarse being used for rough floating, and for finishing the plaster is sent through a fine sieve. The plaster setting quickly is a great advantage, as it enables them to finish a room off at once, so that one preparation is enough for, say, one room. With us it is very different, as we have to wait for the drying of the different coats, causing delay,



Detail of Front Gable.—Scale, ½ Inch to the Foot.

besides keeping more in hand at one time, and finishing nothing right off. The style of work seems rather wasteful to an Englishman. The French plasterer, for good work, makes use of rules or strips of wood cut thin. These he beds or "sticks" against the ceiling, walls or partitions, to serve as guides for the floating rule with which he floats the walls, &c., straight. This adds to the price of the work, the time of the carpenter and the cost of the timber. With us the system is to form our lines or "screeds," with the materials with which we may be working in cornices, whether for internal or external work. In cornices, whether inside or out, the Frenchman uses more tools than we do. We use straight-edges, or joint-rules of cast steel, with a few small tools; this is all



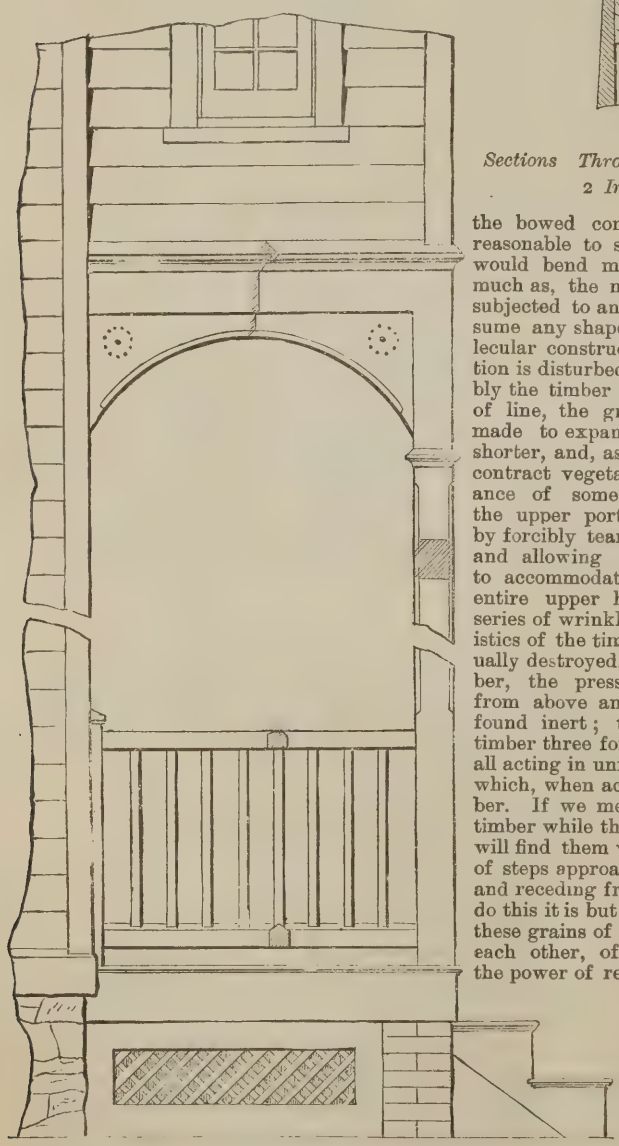
Section Through Water Table.—Scale ¾ Inch to the Foot.

that is requred for our intersections or "miters," but in Paris the workman uses wooden molds, made to the shape of the various members of the cornice he is forming, said molds being akin to those used by our masons. This takes considerably more time than we are in the habit of spending on such work. In plain work they use fewer tools than we do. The principal tool is a rather broad, thick, triangular trowel. With this a man lays or spreads on his material, afterward using one edge as a drag to scrape down all those parts that may be uneven; the work is then finished with a fine coat worked smooth. They are not so particular as ourselves regarding the color of their plaster. We look with distrust upon high-colored plaster, well knowing it sets too quickly to be worked properly, with the grave defect of "giving" or softening after it has been laid on for a few hours.

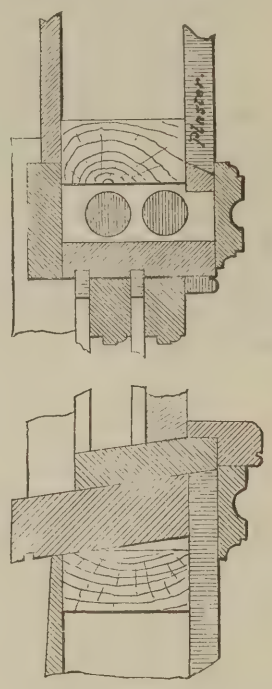
Strength of Materials.

A writer in the *Lumber Trade Journal* discusses the relative advantages of using single timbers of very large size or several timbers of smaller dimensions for given places. Some of the statements which he makes will be found of interest to our readers, and we therefore append the article entire:

With heavy timbers in positions where absolute strength is the primary motive, it often happens that it is optional with the builder whether he put in a single timber of one piece or a number of pieces the aggregate of which would be as large as the single timber, the great question being whether four pieces 1 foot square will bear a greater or less weight than one solid stick 4 feet square, each being of the same variety of wood and alike in all other respects. Before a question of this kind can be answered in a manner to suit all contingencies it becomes very important that the nature of the strain be fully understood. If the slight movement of the ends incident to the bowed condition be admissible, it is reasonable to suppose that the four pieces would bend more without breaking, inasmuch as, the moment a piece of timber is subjected to any influence causing it to assume any shape than the original, the molecular construction and cellular combination is disturbed. Hence, if we bend forcibly the timber 4 feet square a fraction out of line, the grains, as the lower side are made to expand, at the upper side become shorter, and, as it is out of the question to contract vegetable matter without disturbance of some kind, this shortening of the upper portion is accomplished either by forcibly tearing one layer from another and allowing each one to bend of itself to accommodate the inequalities, or else the entire upper half will be composed of a series of wrinkles and the tension characteristics of the timber permanently and effectually destroyed. At the center of the timber, the pressure being counterbalanced from above and below, the particles will be found inert; thus we have with the solid timber three forces of an unequal character, all acting in unison to restore an equilibrium, which, when accomplished, breaks the timber. If we measure the ends of the solid timber while the pressure is in full force, we will find them very uneven, or in the form of steps approaching the center from below and receding from the center above, and to do this it is but reasonable to conclude that these grains of wood must have slided past each other, of course materially affecting the power of resistance to pressure the timber ordinarily possessed. With the four timbers, each 1 foot in diameter, this difficulty is overcome in exact proportion as we have brought mechanical means to bear and separated these tissues in an artificial manner. Now, if we apply the same pressure, though the four timbers may bend further than the solid stick with the same pressure, at the same time it has not lost its power of restoration and will stand repeated pressure much longer, and by examination we will find the same inequalities apparent at the ends, but more unevenly divided, the greatest disparity being at the points of contact with the different sticks. Again, timber sawn in two and the sides reversed will bear a greater pressure and resist it longer than the solid piece, for the simple reason that when these inequalities of pressure are brought to bear we present a side for expansion containing a greater degree of elasticity, and the portions to contract, or that side within the arc when bent, being nearer the center of the tree, are more compact and solid; hence the wrinkling tendency is overcome in a measure. We shall have more to say of this at another time, awaiting, as we are, the results of some tests.



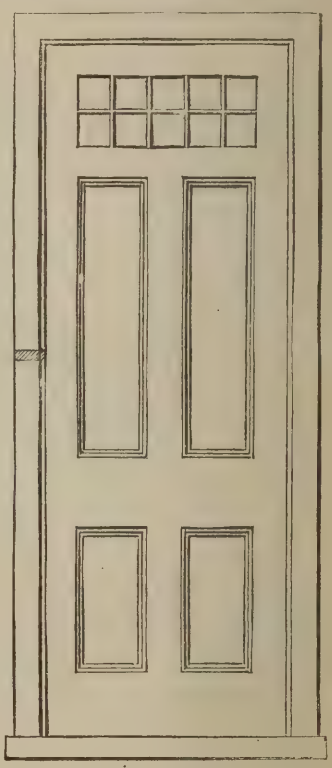
A Cheap Frame House.—Detail of Porch Finish.—Scale, ½ Inch to the Foot.



Sections Through Box Frames.—Scale, 2 Inches to the Foot.

Wood Stains.

The following have been published by a German paper as formulæ for some wood stains, which may be put up in a dry form, and when wanted for use may be readily dissolved in water: Oak wood, 5 kg., of Cassel brown, .5 kg. of potash, and 10 kg. of rain-water, boiled together for an hour, the whole strained through a linen cloth, and the clear, dark-colored liquid boiled to a syrupy consistency. Walnut wood: A decoction of Cassel brown, 3 kg.; potash, .3 kg.; and water, 7 kg.; the whole strained through linen, and during evaporation to syrup 2.5 kg. of extract of logwood added. Mahogany: A decoction of extract of Brazil wood, 3 kg.; potash, .25 kg., and water, 3 kg.; to which, before evaporating to syrup, 150 gr. of eosine are added. Ebony: 5 kg. of extract of logwood, boiled with 11 kg. of water, and, when near the syrupy state, 300 gr. of iron nitrate added; evaporated to a syrup under constant stirring. All the above stains are brought into a dry condition by running the respective syrups into trays of sheet iron, with low rims, in which the syrup hardens, and is afterward broken up and ground.



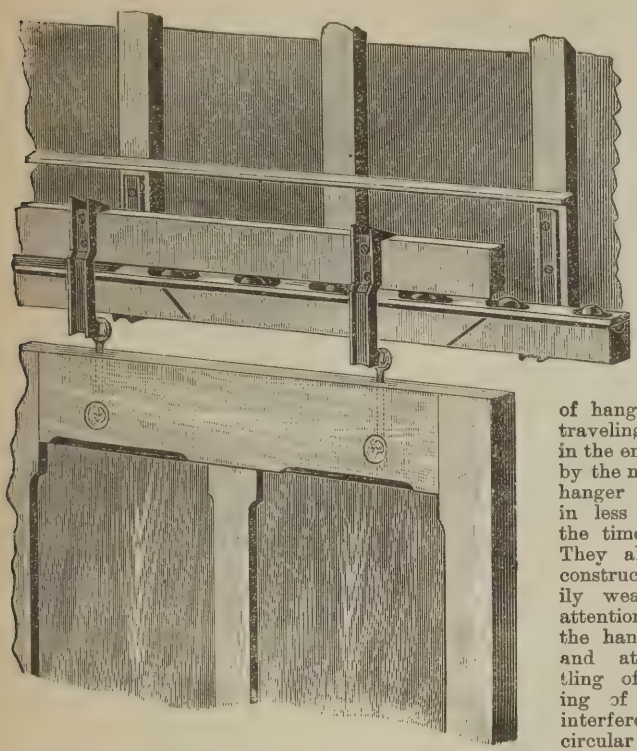
Front Door.—Scale, ½ Inch to the Foot.

Ebonizing.—Apply to the wood, by means of a brush or sponge, a solution of hydrochloric aniline dissolved in water, to which has been added a little protochloride of copper. When this coating has dried apply, similarly, a solution of bichromate of potash dissolved in water. After this process has been repeated two, or at the most three, times, the wood will assume a clear, full, durable, black color, which is neither affected by the action of light nor dampness.

NOVELTIES.

The Ball Bearing Door-Hanger.

There is scarcely any article in the line of builders' hardware that is made in more different forms than door-hangers. It would seem that the inventive ingenuity of mechanics and manufacturers had been specially devoted to the production of this article. Of the numerous forms now before the public each seems to have some particular merit which makes it more advantageous for employment in certain cases than others, or some feature of construction which commends it to favorable consideration. Fig. 1 of our illustrations shows a hanger known as the "Ball Bearing" door-hanger, which is manufactured by the Cohoes Iron Foundry and Machine Company, Cohoes, N. Y. A special feature of this hanger is the absence of journal bearings. By inspection of the engraving it will be seen that the traveling-bar is of a shape very nearly corresponding to the rail. It rests upon balls, which, by the way, are of glass and held in position in a spacer of sheet metal by steel pins passing freely through them. The lower edge of the traveling-bar is hollowed out, corresponding to the size of the balls, thus insuring accurate position at all times. The manner of securing the track to the partition and the method of hanging the door from the traveling-bar are clearly shown in the engraving. It is claimed by the manufacturers that this hanger can be put in place in less than one-quarter of the time required by others. They also claim that by its construction it will not readily wear out. They direct attention to the fact that the hanger is so constructed and attached that the settling of the building or springing of the partitions cannot interfere with its working. A circular which the company have issued relating to this device shows it by a number of detailed cuts, for which we have not space, in a more complete and satisfactory manner than almost any other similar article we have inspected.



Novelties.—Fig. 1.—The Ball Bearing Door-Hanger, Made by the Cohoes Iron Foundry and Machine Co., Cohoes, N. Y.

New Single Surfacer.

Messrs. C. B. Rogers & Co., of Norwich, Conn., inform us that the planing machine shown in Fig. 2 of the accompanying illustrations is entirely new in design. It is of the variety known as single surfacers, and has been gotten up with a special view to making it convenient in all its adjustments. The manufacturers assure us that it is easily operated and is an excellent machine for general shopwork. It has a capacity in width of 24 inches and in thickness of 6 inches. The cylinder and feed-roll boxes are made fast to the frame of the machine, and by means of the hand-crank at the side the bed is raised and lowered for different thicknesses of stock. This arrangement, it is claimed, gives solid foundations for the working parts of the machine. The cylinder is made from a solid-steel forging, is double-belted and runs in self-oiling boxes. Three changes of speed are provided for by means of cone pulleys on the feed-counters. The manufacturers call special attention to the advantages of a quick and an easy change of feed on machines of this class where both hard and soft wood are used, and where the quality of work done is required to be of a high standard of excellence.

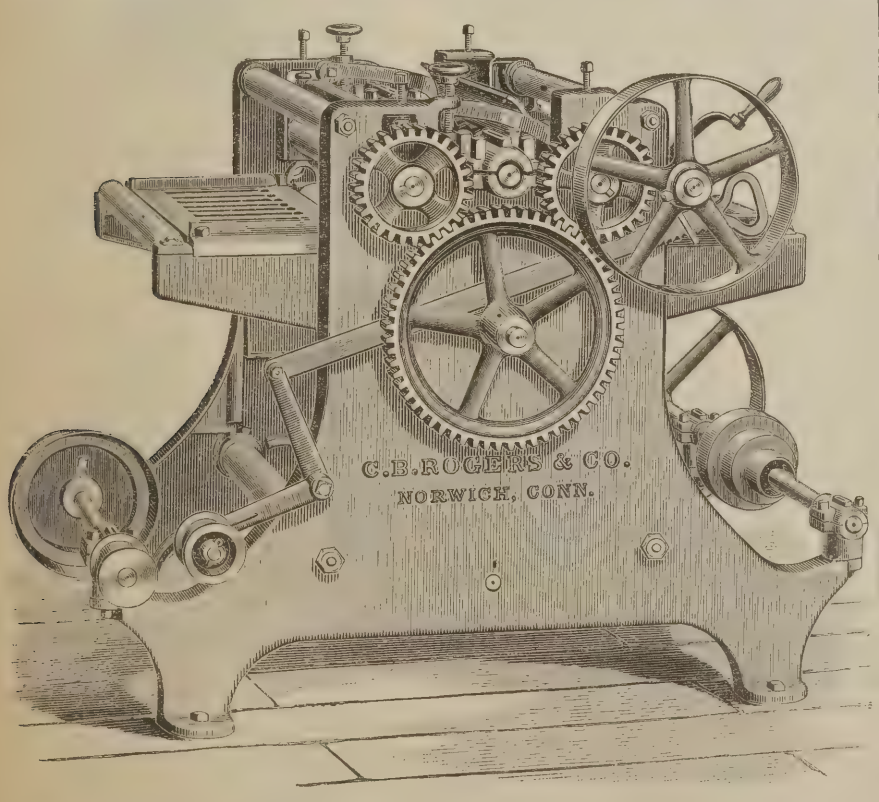


Fig. 2.—New Single Surfacer Brought Out by C. B. Rogers & Co., Norwich, Conn.

Wire Nails.

In a circular issued some time since by the HP Nail Company, of Cleveland, Ohio, there is presented an engraving showing the effect on soft wood of an ordinary cut nail with square point, also of a cut nail with a chisel point, and, in comparison, a wire nail. Fig. 3, which is a *fac simile* of this cut, will convey the idea to the reader's mind. We have examined the original block of wood from which this illustration was prepared, and can testify to the accuracy of the delineation. If there be any error at all, it is that the fractures of fiber with the cut nails are not shown as great as they are in reality. It will be noticed that the chisel-pointed nail does not fracture the wood as much as the blunt-pointed, whereas the wire nail, with sharp point and round shank, cleaves the wood with scarcely any disruption of the fiber. One of the special advantages which wire nails possess over cut nails is herein strikingly illustrated. It is manifest, further, by the illustration that if one of the cut nails should be withdrawn halfway it would be so much loosened as to be comparatively easily removed. The taper of the nail is such that its efficiency is practically overcome the moment it is at all withdrawn from the furthest point to which it is driven. On the other hand, withdrawing a wire nail from the wood into which it has been driven has the effect of lessening its hold simply in proportion to the amount it is drawn out. The nail being of the same diameter throughout, the wood binds as closely upon such portions as remain after it has been partly withdrawn as

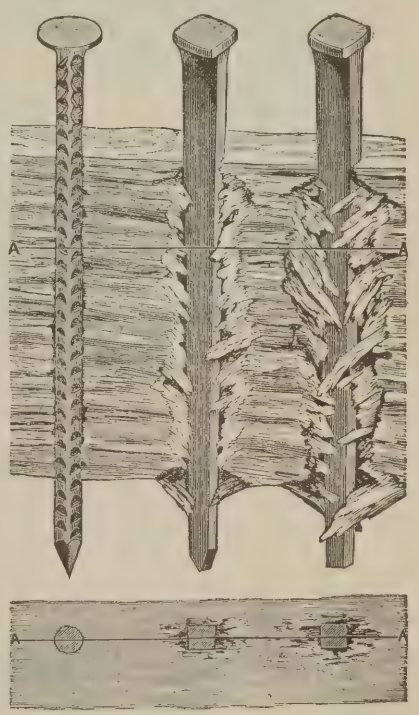


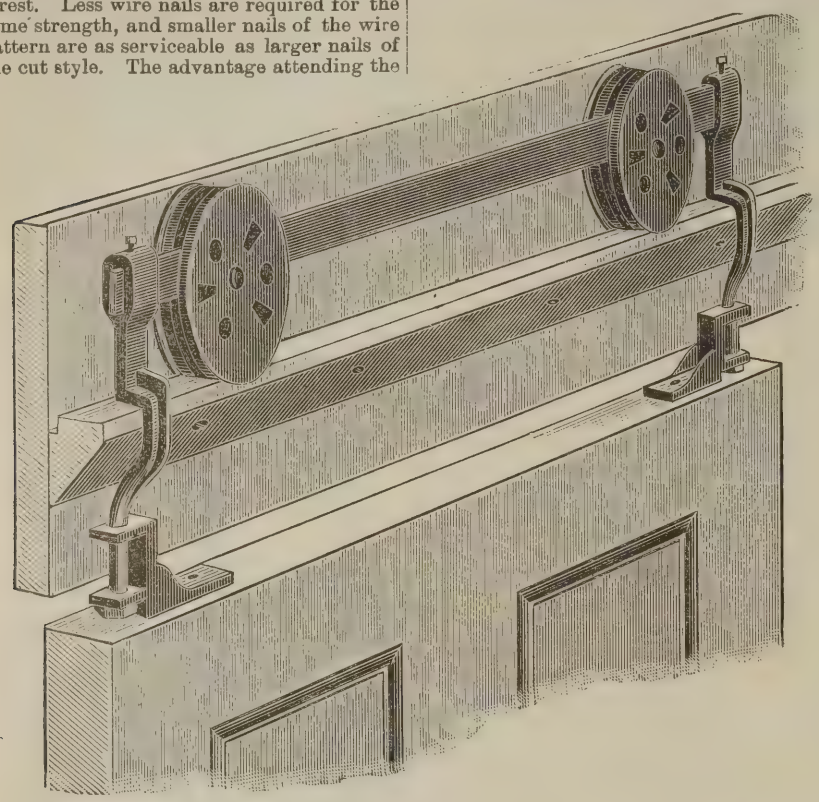
Fig. 3.—The Effect on Wood of Nails of Different Shapes and of Different Kinds of Points.

at the outset. This fact, in connection with the advantage already alluded to, namely, that of not fracturing the wood, renders wire nails of decided advantage in house building over ordinary cut nails, and to this the company above mentioned are directing special attention. Although wire nails have been before the public for some time, they are yet a novelty to many builders, and this account of their advantages will be of interest. Less wire nails are required for the same strength, and smaller nails of the wire pattern are as serviceable as larger nails of the cut style. The advantage attending the use of wire nails has become so thoroughly understood and appreciated in Cleveland, Ohio, where these goods are largely manufactured, that we are informed that it is very common for real estate agents, in the enumeration of the advantages of certain pieces of property, to direct the attention of would-be purchasers to the fact that the woodwork in them is put together with wire nails. We understand that a building in which wire nails are employed commands a higher price than those of the same general style and quality put together with cut nails.

Manufacturers who have goods to ship in cases are also beginning to appreciate the advantage of wire nails, and, accordingly, they are being largely employed in cases, packing boxes, &c. The assortment of nails made by the HP Nail Company is practically exhaustive, and sizes and kinds suitable for almost every purpose are carried in stock. These goods are sold by the hardware trade generally, and, accordingly, are within reach of all who care to use them.

The Ohio Anti-Friction Door-Hanger.

Fig. 4 of the engravings shows a door-hanger with double adjustment made by the Whipple Mfg. Co., Cleveland, Ohio, and known in the trade as the "Ohio" hanger. This device is the production of a builder of many years' experience, and is the result of an effort made to combine the excellencies of many different hangers in the market, and to produce something that would be better adapted to the actual wants of builders than anything heretofore introduced. It will be noticed that the hanger is very simple in its parts, and that an adjustment in any direction desired is provided. No mortising of the doors is necessary, the brackets to which the hangers are connected being fastened to the top of the door. The wheels are slightly flanged and work on a hardwood track. Fig. 5 shows the anti-friction floor guide used with this hanger, and Fig. 6 the center stop. The latter is let into the head jambs, insuring against pulling off of the jambs and marring the side of the door. It is packed with rubber, and accordingly is noiseless. It is put in place without screws and can be easily removed.



Novelties.—Fig. 4.—The Ohio Anti-Friction Sliding Door-Hanger.—Whipple Mfg. Co., Cleveland Ohio.

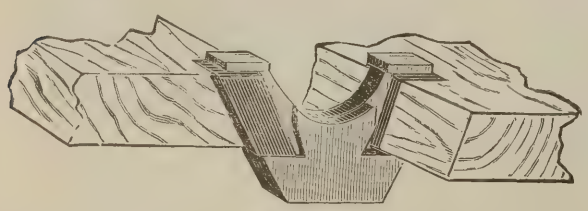


Fig. 5. Anti-Friction Floor Guide Used with the Ohio Hanger.

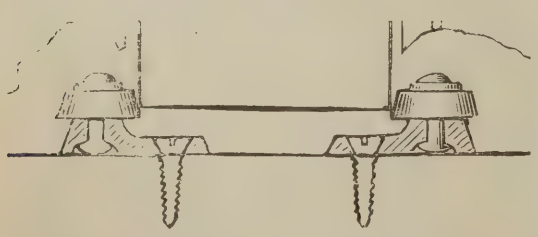


Fig. 6.—Center Stop Used with the Ohio Hanger.

Jenks's Cord Grip.

The object of the improvement illustrated in Figs. 7 to 10, inclusive, is to furnish a stop for the ends of sash cords as a substitute for the knots heretofore tied in the ends for the purpose of connecting the cord to the sash and weight. The grip, a general view of which before receiving the cord is afforded by Fig. 9, is made of malleable iron. It is nearly spherical, with an opening on one side reaching to or beyond the center for the lateral insertion of the cord. The opening or enlargement is made without sharp edges and is so proportioned to the cord as to clamp it tightly before the sides of the opening are in contact with each other. The grip is used on each end, and may be closed upon the cord by inserting in an iron vise or by the use of a hammer. Fig. 10 shows the grip closed upon the cord as above described. Fig. 7 shows the end of the cord connected with the sash, and Fig. 8 the cord connected with a weight. The manufacturer, Henry F. Jenks, Pawtucket, R. I., offers this device as a cheap and reliable substitute for knots. It will not only not untie, but it effects great saving in cord. It may be used for all kinds of cords and ropes where it is desirable to prevent the raveling of the ends, or as a stop for any purpose on any part.

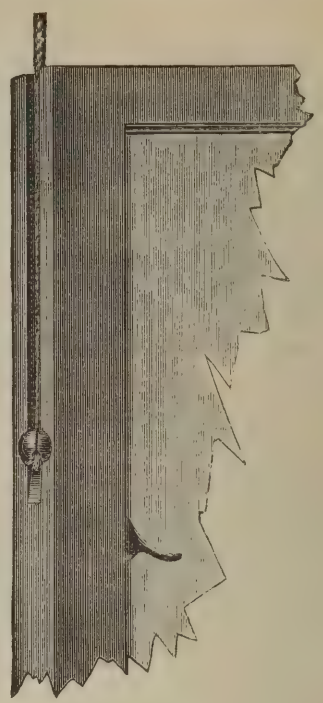


Fig. 7.—Jenks's Cord Grip for Sash and Weights.

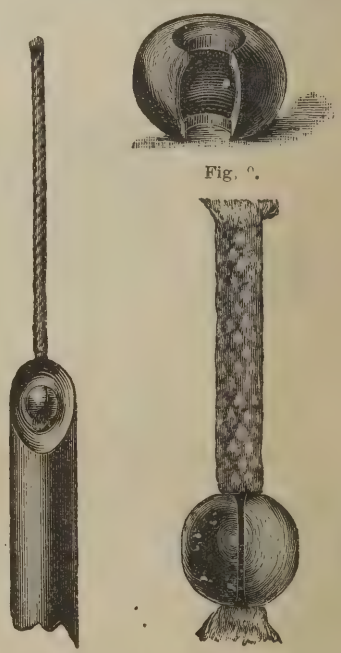


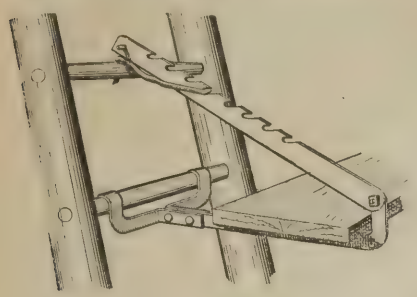
Fig. 8 Fig. 9 Fig. 10

Details of the Jenks Cord Grip.

New Ladder Bracket.

Fig. 11 of our engravings shows a new ladder bracket which is just being introduced by W T. Comstock, of No. 6 Astor Place, New York City, while Fig. 12 shows the application of the same to a ladder hanging vertically against the walls of a building. The facility with which scaffolding can be

erected by means of two or more ladders provided with these brackets will be perceived at a glance, and needs no special description upon our part. The bracket is of



Novelties.—Fig. 11.—New Ladder Bracket

such a character that it may be used in front of the ladder, as shown in Fig. 11, with a ladder hanging vertically, as above mentioned, or it may be used under a ladder when the same is inclined against a building. The bracket as constructed is substantial in character, and the parts are such that an

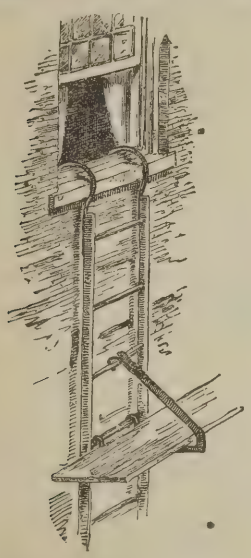


Fig. 12.—Application of the Ladder Bracket to a Ladder Hung Vertically.

accident is practically impossible. Sufficient adjustment is provided to adapt it to use under various circumstances.

Hollow and Round Attachment.

The Stanley Rule and Level Company, of 29 Chambers street, New York, have recently brought out an extra attachment for

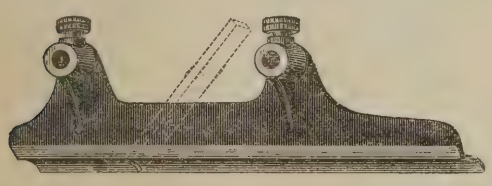


Fig. 13.—"Round" Attachment for Adjustable Beading, Rabbet and Sliding Plane.

their adjustable beading, rabbet and slitting plane, a detailed description of which was given in *Carpentry and Building* for November, 1884. These adjustments are shown

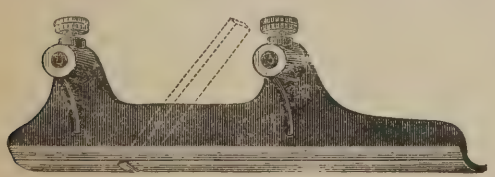


Fig. 14.—"Hollow" Attachment for the Same Tool.

in Figs. 13 and 14, and are designated by the common terms of "hollows" and "rounds." Their purpose is to enable the operator to work either hollows or rounds as may be required, with great facility and accuracy. The bit is secured in the stock in the same manner as for all other uses of the tool, and the corresponding form of face slides on to the arms. The fence or gauge to the plane may be also attached to the arms afterward, which would enable hollows or rounds to be accurately worked at any distance from the edge of a board and without the previous use of any other tools. All the parts of the plane to which these attachments belong are made interchangeable. Accordingly, the new pieces will fit any plane of the style mentioned, a fact which will enable mechanics who are using this tool to buy such sizes as they need and at the times they are required for use.

Builders' Level with Sighting Attachment.

Notwithstanding the many instruments which have been devised for facilitating the work of leveling about buildings, running

Fig. 16.—Builders' Level with Sighting Attachment.

drains, establishing grades and doing other similar work, the builders' level is very frequently employed for the purpose, and it is often used in preference to more elaborate instruments simply on account of its general availability. On the other hand, every one who has attempted to run lines in this manner realizes the difficulty of accurately sighting across the top of a piece of polished mahogany. Many temporary devices are resorted to to facilitate work of this kind and insure accurate results. Sometimes screw eyes are inserted near the ends of the stock of the level, and in other cases simple blocks are temporarily fastened in place against the ends and the sight is taken across their tops. John W. Harmon, 65 Haverhill street, Boston, Mass., has recently introduced an improvement to the ordinary builders' level that will no doubt supersede many of the home-made attachments of the kind we have described above. Fig. 16 of the engravings shows an instrument of this kind with the improvement added. It will be seen that it consists simply of sights at the ends, the latter being made adjustable, so as to be used at different hights and under different conditions These sights are secured in suitable cases, into which they recede when not required for use, thus leaving the level as useful and convenient for ordinary work as though they were not present. Mr. Harmon applies this improvement to the ordinary builders' level, and also to levels of special lengths made for pavers' use and those who are employed about street work, sewers, &c.

The "Rapid Transit" Wrench.

Fig. 15 represents a wrench being introduced by F. Armstrong, of Bridgeport, Conn., which is called the "Rapid Transit" wrench. Its features are a self-adjusting ratchet, clearly shown in the engraving, which makes it of quick adjustment, and the shape of the jaws, which adapt it to various uses. It is a tool that is very convenient for mechanics in various lines on account of the wide range of uses to which it may be applied. The maker claims that it is susceptible of quicker adjustment than any wrench in the market. It can be used on either square or round surface. In many particulars it takes the place of the ordinary monkey-wrench; it is also serviceable as a pipe-wrench. Two sizes are manufactured, one having a capacity from zero to ½ inch and the other from zero to 1 inch. To open the wrench the self-adjusting ratchet shown in the center of the engraving, and which is held in place by a spring, is lifted by the thumb and finger. When released, this ratchet engages in the teeth cut in the shank of the wrench, thus fitting it for use at whatever point it may be dropped.

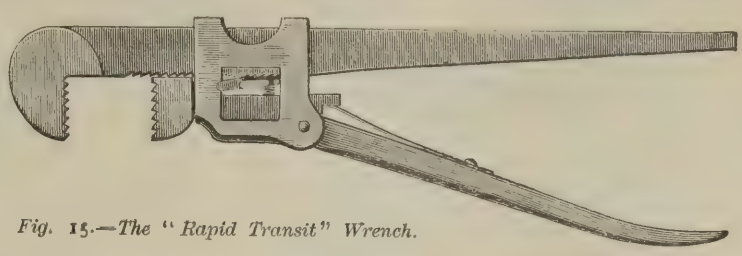


Fig. 15.—The "Rapid Transit" Wrench.

Double-Clasp Blind-Slat Holder.

Fig. 17 shows, full size, a blind-slat holder which John W. Harmon, of 65 Haverhill street, Boston, Mass., is now putting upon the market. This clasp consists of two pieces of sheet metal, preferably brass, united at the center, and moving about the pivot thus provided. The parts are made slightly concave, so as to afford the necessary spring for taking up the end motion of the blind slat. Fig. 19 shows the method of applying the device. It is opened as shown at A, and passed between two slats, after which it is closed as shown at B. In closing,

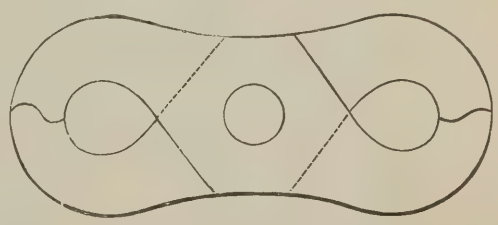


Fig. 17.—Double Clasp Blind-Slat Holder.

the ends encircle the pivots of two slats, as shown, and form a wedge between the slat and the stile of the blind. Fig. 18 shows the appearance of the blind with the holder in

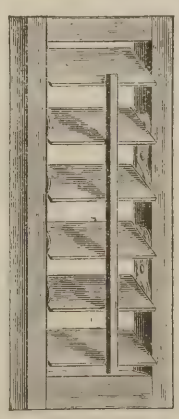


Fig. 18.

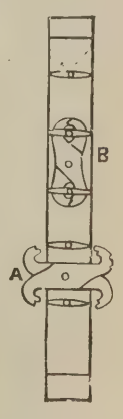


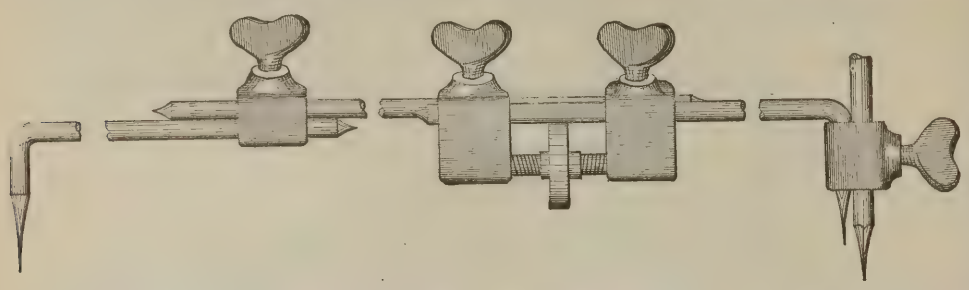
Fig. 19.

Elevation and Section, Showing Application of Blind-Slat Holder.

use. The special advantage to which the maker directs attention is that no tools are required for putting this device in place. It is self-contained and very effective.

Combined Beam Compasses and Calipers

A new and very useful tool, constructed upon novel principles, is illustrated in Figs. 20 to 23 of the accompanying engravings.



Novelties.—Fig. 20.—Combined Beam Compasses and Calipers.—The Tool Arranged with Pencil Point at One End.

The tool complete consists of the beam compass and its two rods 15 inches long, two straight rods 9 inches long, two bent rods 5¾ inches long, and four couplings. With these parts various combinations are possible, making the tool at once a beam compass that will describe circles from 6 inches to 7 feet in diameter, and an inside and outside caliper with a capacity of from 6 to 40 inches. A pencil point can be inserted in one end of the beam compass by the use of a coupling, so as to still further increase the capacity of the tool. One feature that distinguishes this article from anything similar that has preceded it is the method of adjustment. The mechanism for this purpose consists of two metal blocks, drilled to receive two rods united by a right and a left hand screw, which affords the means of fine adjustment. Each block is tapped for a thumb-screw, so that a rod fastened to one block passes freely through the other block, and *vice versa*. In using the tool as a beam compass the thumb-screws are loosened and the rods are moved so that their points will be near the required position. The thumb-screws are then tightened, and for fine adjustment the double-threaded screw shown between the two blocks is used. For describing a circle larger than the long rods furnished with the tool will permit, the bent rods are removed and straight rods are put in their place; then the bent rods are added to the straight rods by means of couplings. Still larger circles than the nominal capacity of the tool may be described by coupling on any rod of suitable size and of any desired length. By this means a beam compass of any required capacity is secured, with a device at one end for minute adjustment of the points. For inside calipering the points on the straight end of the rods are used. To caliper from 6 to 9 inches, the short bent rods which are furnished are used. For calipering from 9 to 15 inches, the straight rods are used, and for other sizes the length is increased in the same general manner as described for beam compasses. For outside calipering the short bent rods are coupled on to the beam compass points. Lengths are increased in this case in the same general manner as described for the beam compass. This tool will be appreciated by carpenters, pattern-makers, millwrights and members of the various mechanical trades who have occasion to describe circles or caliper work over 6 inches in diameter. Four sizes are made, taking rods from $\frac{3}{16}$ to $\frac{3}{8}$ inch in diameter. J. Q. Maynard, of No. 12 Cortlandt street, New York, is putting this article upon the market.

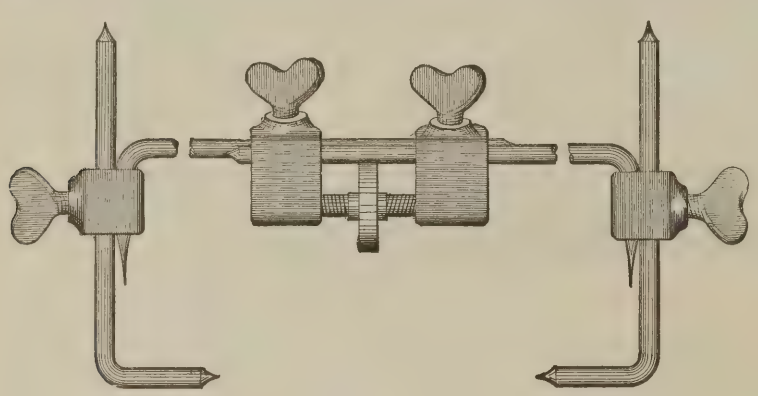


Fig. 21.—The Tool Arranged for Outside Calipering.

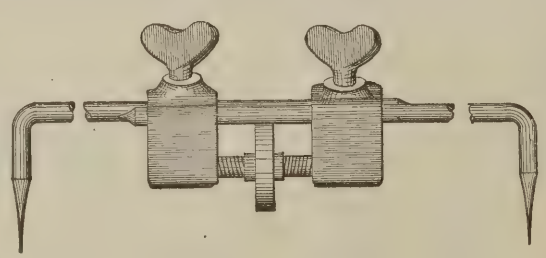


Fig. 22.—The Tool Arranged for Describing Small Circles.

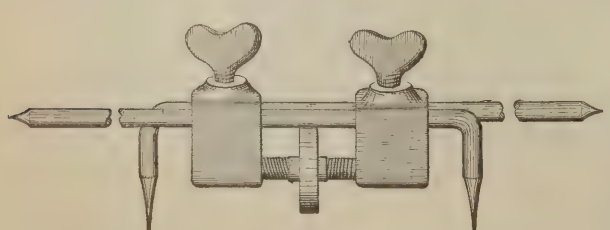


Fig. 23.—The Tool Arranged for Inside Calipering.

This is an age of shams, and the art of giving to bronzes an appearance of antiquity is not the least of them. This is readily done by applying a mixture of ground horseradish and vinegar to the places on the statue which it is desirable to stain a verdigris green. It will take three or four days to work the transformation. Meanwhile the horseradish must be kept wet with vinegar.

Quarter-Sawed Timber.

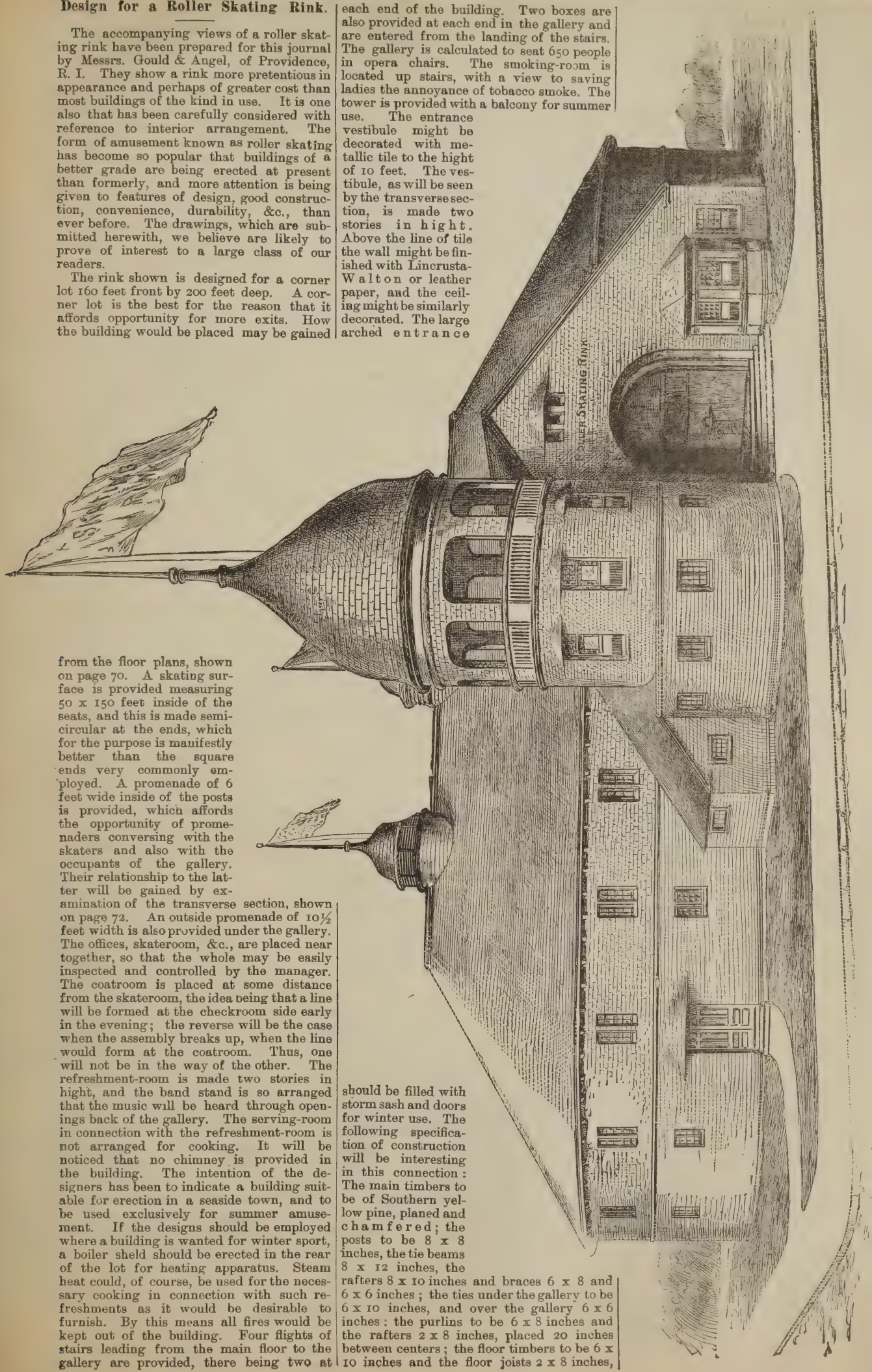
Several correspondents have inquired for information concerning the term, "quarter-sawing," which is occasionally met with in architects' specifications and in the price lists of lumber. Quarter-sawing is used in contradistinction to the term "bastard-sawing," the latter referring to the style in which lumber is ordinarily produced. In bastard-sawing the log is put upon the carriage of the sawmill in any way most convenient, and is first squared and then cut into lumber, according to requirements, the various boards or plank being cut parallel to one of the sides of the squared log. It is well known that a bastard-sawed board, no matter from what kind of timber it is cut, will wear rough and sliver when in constant use, as for flooring or for driveways. This grows out of the nature of the trunks of trees. In the issue of *Carpentry and Building* for August, 1879, we presented an illustrated article showing the nature of the growth of trees and the consequent influence upon timber. In one of the illustrations presented in that connection we showed a log cut into five planks, illustrating the effect of seasoning on each piece. The middle piece, it was shown, had a tendency in the shrinking process to become thinner at its outer edges and retain its full thickness at the center. The outer planks, it was shown, had a tendency to warp, the direction of the warp depending upon their relative position to the heart of the log from which they were cut. This tendency to warp explains why bastard-sawed timber or plank is less durable, as above mentioned, when used in such a manner as is likely to tear up slivers. It is also less durable when exposed to the weather for by the same causes it would suffer more or less damage on account of receiving and retaining moisture.

In quarter-sawing each log is first cut into quarters, a fact which gaves it its name. The planks to be cut from the log are then sawn in such a manner as to be more or less radial to the center of the log. By this means the cuts run obliquely across the medullary rays. The tendency to warp in planks thus cut is different in character from that of bastard-sawed boards, resulting in better working properties. An exchange in discussing the question of quarter-sawed yellow pine, which it advocates on account of the greater durability of the lumber thus produced, contains the following remarks, in which our readers will doubtless be interested: "It would be impossible to conceive of a harder, more durable, flooring than yellow pine would make if it were quartered. The pitch it contains would give it an advantage over oak, ash or maple in point of durability. A few of the Southern millmen are beginning to understand the merits of such flooring, and are selecting the few quartered boards that every log sawed the old-fashioned way invariably has, and putting them in a grade by themselves. It is a bad way of doing, for the balance of the flooring is depreciated in value, and, in fact, sometimes almost worthless, for no man that is acquainted with its defects would think of making a floor of it. It might answer for a floor that is to be kept carpeted, but usually such a floor is made of softer and cheaper wood The expense of quarter-sawing would be considerably in excess of the usual way of manufacture, but the flooring would be richly worth the difference. Quartered oak in the large markets is worth on an average $10 per 1000 more than clear oak sawed bastard, and there ought to be nearly that difference between the two kinds of yellow-pine flooring. A log, if quarter-sawed, does not yield as much lumber as if sawed the the other way, and sawing that way is a slower job. Quartered flooring ought to be one of the productions of the Southern mills. Builders should not object to paying a third more for it, when they know its beauty and durability are more than doubled as compared with bastard, and every intelligent builder ought to know that such is the fact."

Design for a Roller Skating Rink.

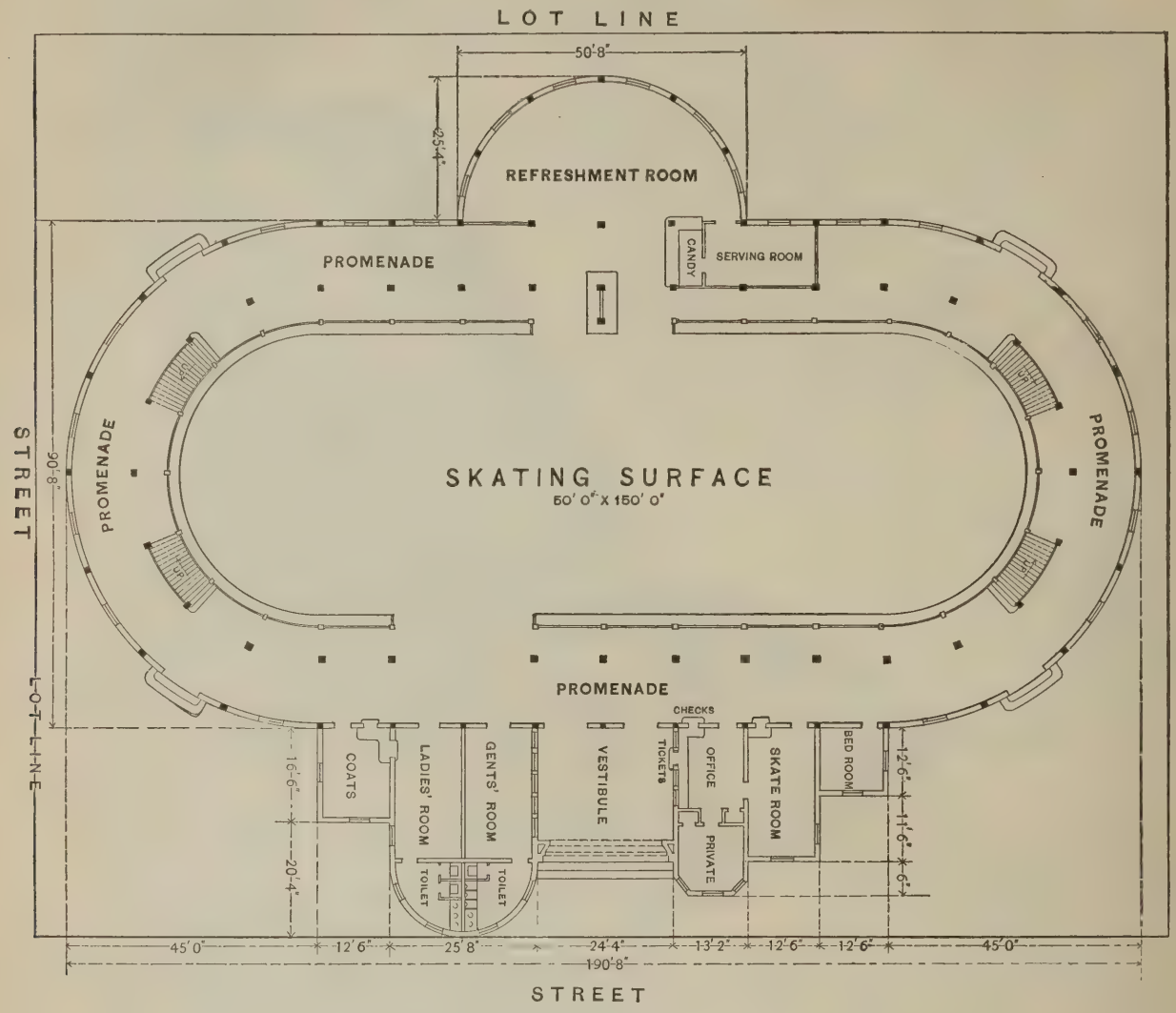
The accompanying views of a roller skating rink have been prepared for this journal by Messrs. Gould & Angel, of Providence, R. I. They show a rink more pretentious in appearance and perhaps of greater cost than most buildings of the kind in use. It is one also that has been carefully considered with reference to interior arrangement. The form of amusement known as roller skating has become so popular that buildings of a better grade are being erected at present than formerly, and more attention is being given to features of design, good construction, convenience, durability, &c., than ever before. The drawings, which are submitted herewith, we believe are likely to prove of interest to a large class of our readers.

The rink shown is designed for a corner lot 160 feet front by 200 feet deep. A corner lot is the best for the reason that it affords opportunity for more exits. How the building would be placed may be gained from the floor plans, shown on page 70. A skating surface is provided measuring 50 x 150 feet inside of the seats, and this is made semicircular at the ends, which for the purpose is manifestly better than the square ends very commonly employed. A promenade of 6 feet wide inside of the posts is provided, which affords the opportunity of promenaders conversing with the skaters and also with the occupants of the gallery. Their relationship to the latter will be gained by examination of the transverse section, shown on page 72. An outside promenade of 10½ feet width is also provided under the gallery. The offices, skateroom, &c., are placed near together, so that the whole may be easily inspected and controlled by the manager. The coatroom is placed at some distance from the skateroom, the idea being that a line will be formed at the checkroom side early in the evening; the reverse will be the case when the assembly breaks up, when the line would form at the coatroom. Thus, one will not be in the way of the other. The refreshment-room is made two stories in hight, and the band stand is so arranged that the music will be heard through openings back of the gallery. The serving-room in connection with the refreshment-room is not arranged for cooking. It will be noticed that no chimney is provided in the building. The intention of the designers has been to indicate a building suitable for erection in a seaside town, and to be used exclusively for summer amusement. If the designs should be employed where a building is wanted for winter sport, a boiler sheld should be erected in the rear of the lot for heating apparatus. Steam heat could, of course, be used for the necessary cooking in connection with such refreshments as it would be desirable to furnish. By this means all fires would be kept out of the building. Four flights of stairs leading from the main floor to the gallery are provided, there being two at each end of the building. Two boxes are also provided at each end in the gallery and are entered from the landing of the stairs. The gallery is calculated to seat 650 people in opera chairs. The smoking-room is located up stairs, with a view to saving ladies the annoyance of tobacco smoke. The tower is provided with a balcony for summer use. The entrance vestibule might be decorated with metallic tile to the hight of 10 feet. The vestibule, as will be seen by the transverse section, is made two stories in hight. Above the line of tile the wall might be finished with Lincrusta-Walton or leather paper, and the ceiling might be similarly decorated. The large arched entrance should be filled with storm sash and doors for winter use. The following specification of construction will be interesting in this connection: The main timbers to be of Southern yellow pine, planed and chamfered; the posts to be 8 x 8 inches, the tie beams 8 x 12 inches, the rafters 8 x 10 inches and braces 6 x 8 and 6 x 6 inches; the ties under the gallery to be 6 x 10 inches, and over the gallery 6 x 6 inches; the purlins to be 6 x 8 inches and the rafters 2 x 8 inches, placed 20 inches between centers; the floor timbers to be 6 x 10 inches and the floor joists 2 x 8 inches,



DESIGN FOR ROLLER SKATING RINK, PREPARED BY GOULD & ANGEL, ARCHITECTS, PROVIDENCE, R. I.

placed 16 inches between centers; the floor to consist of two thicknesses—the under floor to be of 2-inch spruce plank and the upper of hard maple; the roof boards to be 1⅛-inch spruce, planed and matched, the grates and open fireplaces in addition to steam heat, and the coal is furnished at cost. The tenth and eleventh stories are finished with the same elegance as the rest of the building, but especially for artists' Sound, far up the Hudson and back of Jersey Hights. The roof has a floor of brick as solid as a Broadway pavement, and is surrounded with a high balustrade. This will be the playground of the children, with



First Floor Plan, with Outline of Lot and General Dimensions.—Scale, $\frac{1}{32}$ Inch to the Foot.

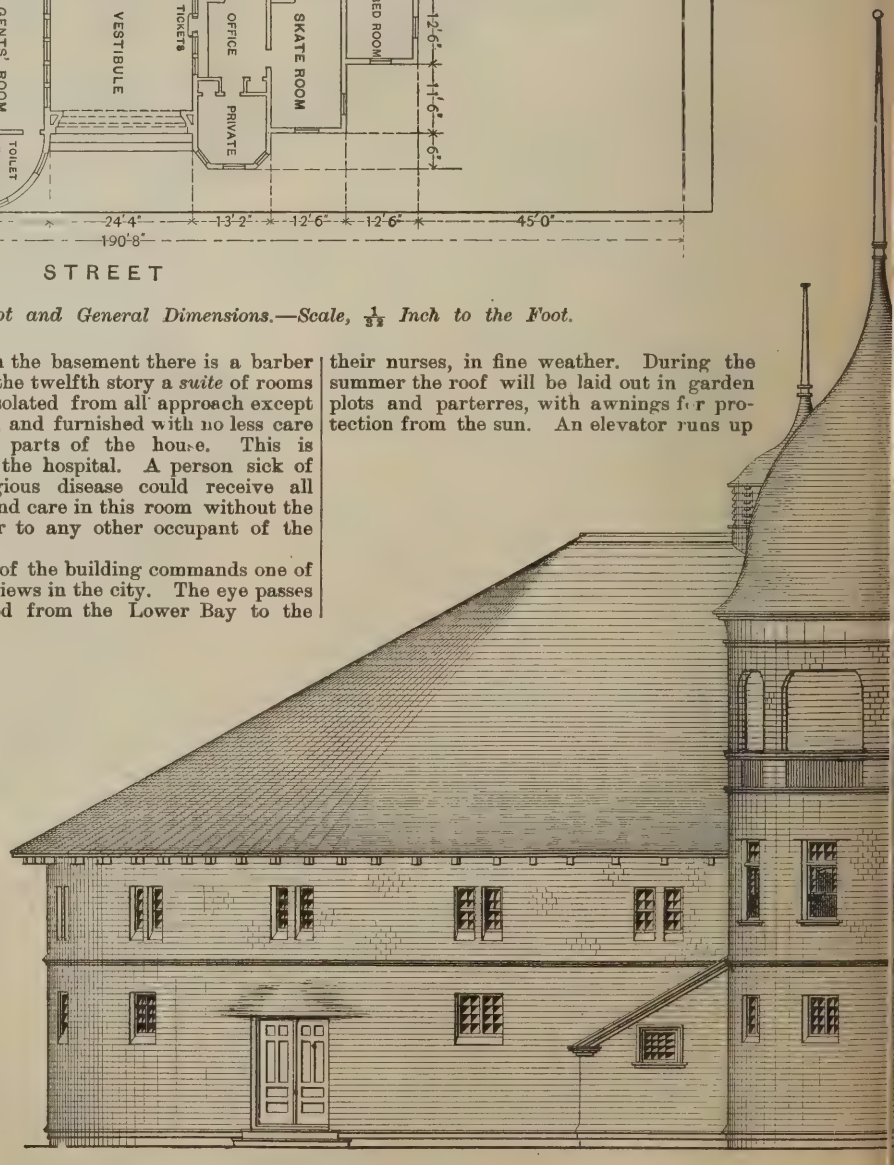
sides to be of the same; the outside of the building to be covered one story, with the exception of the tower, with clapboards; the second story, the tower and the roofs to be covered with shingles; the lower story of the building to be painted a dark olive-green, also the trimmings; the shingles on side walls of main building to be stained and oiled a dark reddish yellow; the tower walls to be stained the whole hight with a considerably darker shade, and the same stain is used on the other shingles; the roofs to remain unpainted.

A Typical Modern Apartment House.

The following description of a large apartment house, which has recently been completed on the west side of the city, will no doubt be read with interest. The house occupies seven city lots and rises to a hight of nearly 200 feet above the pavement:

Probably more than a thousand persons will find homes or occupation in this vast building. A large force of employees will be required to conduct the daily routine. These will have rooms in a building in the rear. The kitchen, laundry, refrigerators, butcher shop, coalrooms, engines of 200 horse-power, gas and electric-light apparatus, are in the cellars and under the front sidewalk. Most of the families have two or more servants of their own. In the *suites* there are kitchens with ranges for cooking by gas or steam if the families do not wish to go to the restaurant. Each family may give its order from its own rooms and have the meals sent to the apartment. The meals are provided for the stockholders on a basis nearly at cost. Each set of apartments has studios. In the basement there is a barber shop. On the twelfth story a *suite* of rooms has been isolated from all approach except by the roof, and furnished with no less care than other parts of the house. This is known as the hospital. A person sick of any contagious disease could receive all attention and care in this room without the least danger to any other occupant of the house.

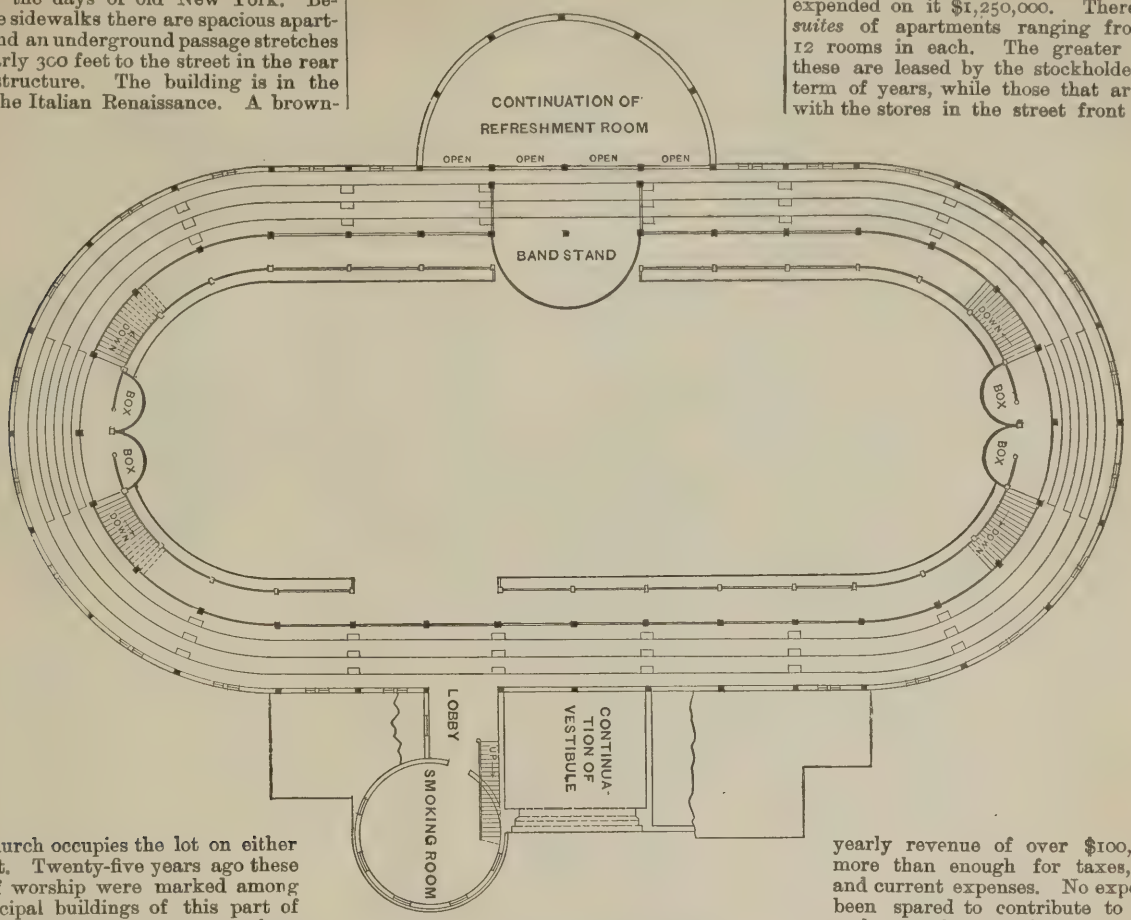
The roof of the building commands one of the finest views in the city. The eye passes unobstructed from the Lower Bay to the their nurses, in fine weather. During the summer the roof will be laid out in garden plots and parterres, with awnings for protection from the sun. An elevator runs up



DESIGN FOR ROLLER SKATIN

to the roof and meals may be taken there.

The cellars are blasted 30 feet deep in the solid rock on which the village goats gamboled in the days of old New York. Beneath the sidewalks there are spacious apartments, and an underground passage stretches back nearly 300 feet to the street in the rear of the structure. The building is in the style of the Italian Renaissance. A brownstone church occupies the lot on either side of it. Twenty-five years ago these places of worship were marked among the principal buildings of this part of New York. Even now an atmosphere of quiet and substantial respectability seems to emanate from them and envelope the neighbor which overshadows them. The castle-like tower of one of these churches does not reach half way up the side of the apartment house, and the fifth story of the "parsonage" is on a level with the "lower"

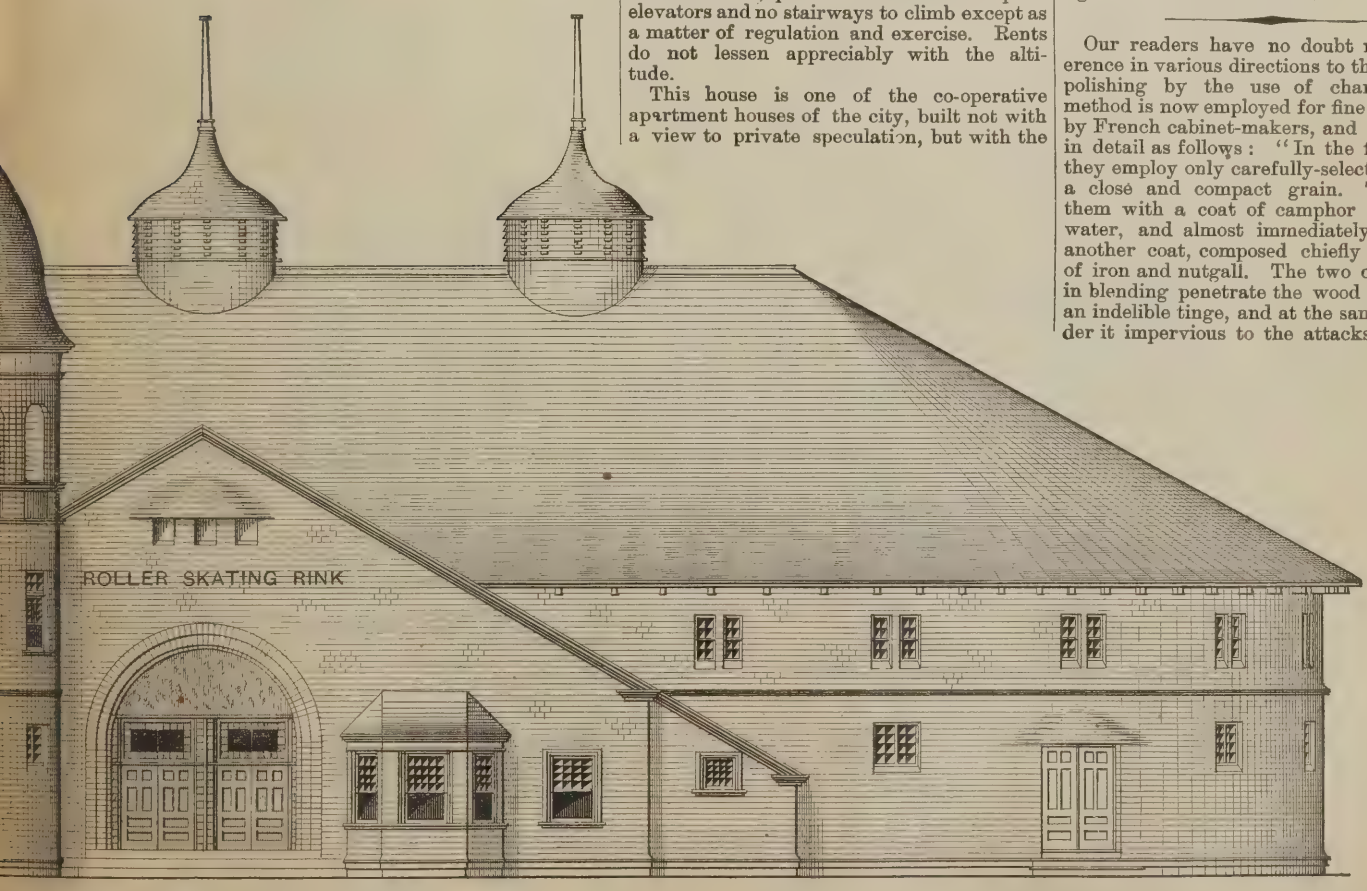


Gallery Plan.—Scale, $\frac{1}{32}$ Inch to the Foot.

parlors of the apartment house. Hight is no objection in a modern apartment in the center of New York, provided there are "rapid" elevators and no stairways to climb except as a matter of regulation and exercise. Rents do not lessen appreciably with the altitude.

This house is one of the co-operative apartment houses of the city, built not with a view to private speculation, but with the purpose of combining the comforts of a home and a private hotel. Some 50 persons of means organized a stock company for the purpose of building the house. They have expended on it $1,250,000. There are 97 *suites* of apartments ranging from 3 to 12 rooms in each. The greater part of these are leased by the stockholders for a term of years, while those that are rented with the stores in the street front afford a yearly revenue of over $100,000, far more than enough for taxes, repairs and current expenses. No expense has been spared to contribute to comfort and convenience. The structure is fireproof. Only the furniture and trimmings are combustible. The woodwork of the apartments is of mahogany, cherry or light wood, as the owner's taste prefers, and the frescoing of the apartments is also in designs of the owner's choice.

Our readers have no doubt noticed reference in various directions to the method of polishing by the use of charcoal. This method is now employed for fine black work by French cabinet-makers, and is described in detail as follows: "In the first process they employ only carefully-selected woods of a close and compact grain. They cover them with a coat of camphor dissolved in water, and almost immediately afterward another coat, composed chiefly of sulphate of iron and nutgall. The two compositions in blending penetrate the wood and give it an indelible tinge, and at the same time render it impervious to the attacks of insects.



Front Elevation.—Scale, $\frac{1}{16}$ Inch to the Foot.

K, PREPARED BY GOULD & ANGEL, ARCHITECTS, PROVIDENCE, R. I.

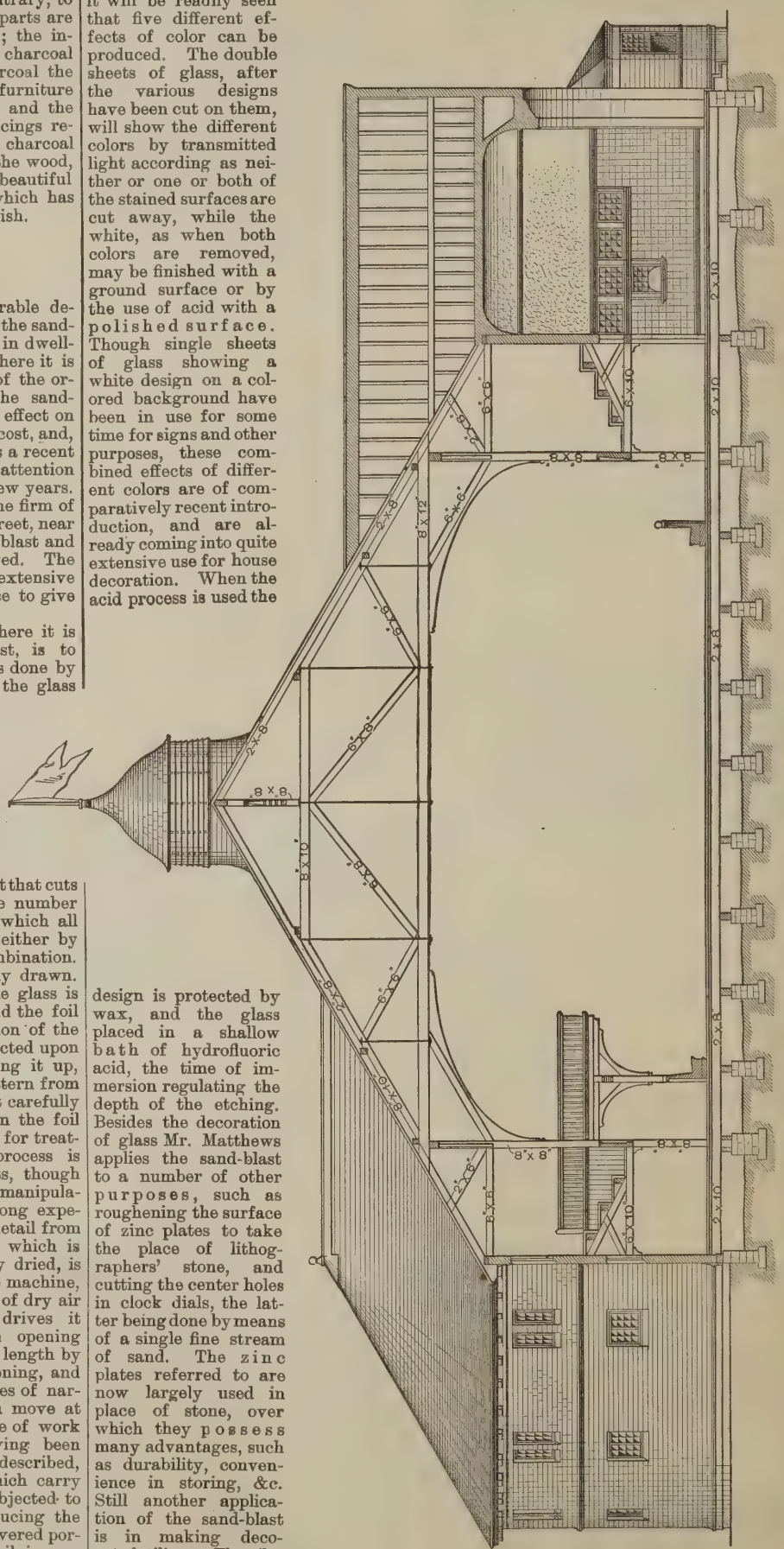
When these two coats are sufficiently dry they rub the surface of the wood at first with a very hard brush of couch grass (*chiendent*), and then with charcoal of substances as light and friable as possible, because if a single hard grain remained in the charcoal this alone would scratch the surface, which they wish, on the contrary, to render perfectly smooth. The flat parts are rubbed with natural stick charcoal; the indented portions and crevices with charcoal powder. Alternately with the charcoal the workman also rubs his piece of furniture with flannel soaked in linseed oil and the essence of turpentine. These pouncings repeated several times cause the charcoal powder and the oil to penetrate the wood, giving the article of furniture a beautiful color, and also a perfect polish which has none of the flaws of ordinary varnish.

Decorated Glass.

Of late there has been considerable demand for decorated glass, made by the sand-blast and etching processes, for use in dwelling-houses and other buildings, where it is said to be largely taking the place of the ordinary kinds of stained glass. The sand-blast produces practically the same effect on glass as grinding does, at a far less cost, and, though the process is by no means a recent invention, it has not received the attention it deserved until within the last few years. At the decorated-glass works of the firm of John Matthews, on Twenty-sixth street, near First avenue, New York, the sand-blast and etching processes are both employed. The variety of work done there is so extensive that it is impossible in brief space to give any complete description of it.

The first steps in the process, where it is intended to employ the sand-blast, is to thoroughly clean the glass, which is done by careful washing. One surface of the glass is then covered with tinfoil, which is fastened to it by the aid of wax. There is a special machine for putting on the foil, consisting of rollers and an endless belt underneath, the several parts being so arranged that the foil can be reeled off a roller and fastened evenly on the surface of the glass. The design is drawn on the foil-covered surface with a sharp instrument that cuts through to the glass. A very large number of stencils are kept in stock, from which all ordinary designs can be produced, either by one or several stencil plates in combination. Other designs have to be specially drawn. Having transferred the pattern, the glass is given a second coating of wax, and the foil is then removed from that portion of the surface of the glass that is to be acted upon by the sand-blast by simply tearing it up, the scribed lines preventing the pattern from being injured. The design is next carefully inspected and all imperfections in the foil filled up. The plate is now ready for treatment by the sand-blast. The process is worked under Tilghman's patents, though the machinery and method of manipulation employed are the results of long experience, and differ considerably in detail from those originally used. The sand, which is the ordinary beach sand carefully dried, is fed in a hopper at the top of the machine, and, descending, is met by a blast of dry air from a Sturtevant blower that drives it downward and out through an opening called "the gun," about 3 feet in length by ⅜ inch in width. Under this opening, and but a few inches from it, is a series of narrow, endless leather belts which move at a velocity depending upon the style of work to be done. The sand-blast having been turned on, the glass, prepared as described, is placed on the moving belts, which carry it under the "gun," where it is subjected to the action of the sand, thus producing the ground appearance on all the uncovered portions of the surface. The tinfoil is protected during the operation by the coating of wax, which, being a yielding substance, resists the cutting action of the sand. The glass having been thus treated is cleaned of the remaining foil and washed, when the design is seen either in relief or otherwise, as the case may be.

A novel feature in this style of decorated glass consists in the use of one or more glass lights of the same or different colors. The effect produced by such combinations is very pleasing, due to the blending of the different colors. When two lights of different colored glass are used it will be readily seen that five different effects of color can be produced. The double sheets of glass, after the various designs have been cut on them, will show the different colors by transmitted light according as neither or one or both of the stained surfaces are cut away, while the white, as when both colors are removed, may be finished with a ground surface or by the use of acid with a polished surface. Though single sheets of glass showing a white design on a colored background have been in use for some time for signs and other purposes, these combined effects of different colors are of comparatively recent introduction, and are already coming into quite extensive use for house decoration. When the acid process is used the design is protected by wax, and the glass placed in a shallow bath of hydrofluoric acid, the time of immersion regulating the depth of the etching. Besides the decoration of glass Mr. Matthews applies the sand-blast to a number of other purposes, such as roughening the surface of zinc plates to take the place of lithographers' stone, and cutting the center holes in clock dials, the latter being done by means of a single fine stream of sand. The zinc plates referred to are now largely used in place of stone, over which they possess many advantages, such as durability, convenience in storing, &c. Still another application of the sand-blast is in making decorated tiling. The tiles of opal glass with colored surfaces can be made in lengths of 2 or 3 feet, the design being cut in a manner similar in principle to that used in decorating glass. What we have briefly described are but the more important applications of the sand-blast process, it having various other special uses which cannot here be noticed. Decorated glass of this description is an excellent substitute for the cheap stained glass that has been used of late to a very large extent. The firm of John Matthews deserve a large share of credit for the perfection to which they have brought this process, for, though known for a number of years, it was never before given the attention it deserved in the way of improving its application and making it of practical value in the arts.



Transverse Section.—Scale, ⅛ Inch to the Foot.

DESIGN FOR ROLLER SKATING RINK, PREPARED BY GOULD & ANGEL, ARCHITECTS, PROVIDENCE, R. I.

Natural Wood Ornaments.

The engravings on this page represent a few designs of natural wood ornaments manufactured by the Taft Company, of Hartford, Conn. These ornaments show a depth and finish unequaled by any other samples which have come to our notice. They are produced under pressure in very powerful machinery and by very accurate and finely-finished dies. The ornamentation is impressed in the end wood, resulting in a finish that could not be obtained by impressions on the side of the grain. Some of the samples which have been submitted to us are veritable gems, and compare favorably in many

Panel Ornament.—¼ Full Size.

particulars with the most artistic handwork. Of course by this process it is impossible to obtain any undercut, but in other respects the work is finer than any hand-carving as ordinarily produced. The surface is finished, requiring no dressing up, and the backs are smoothed off, adapting them for immediate application to the work they are to decorate. The Taft Company have in preparation at the present time a somewhat extensive catalogue of the designs which they manufacture, and the engravings presented herewith are selections from it. The assortment comprises rosettes of various sizes, moldings, panels with and without borders, and various nondescript ornaments which are frequently required in connection with modern joinery and cabinet-work. The captions under the engravings shown herewith indicate the scale of the cuts.

A dealer in Japanese goods in New York has fitted into the back of his store a real Japanese house in miniature. Only two rooms, however—reception-room and parlor—are represented. The house was brought from Japan in sections and put together here by a Japanese artisan after their custom, without nails, glue forming the necessary

Square Panel Ornament.

substitute. The material for the framework is of Japanese cedar and bamboo; a strong, transparent paper forms the little square panes for the windows, glass being only used by the lower classes. The moldings of the roooms are of lacquer of a very artistic and beautiful pattern, and the ceilings are of bamboo, braided in different designs and colored in different shades of brown. The floors are especially curious, being made very elastic, a sort of split bamboo or straw forming a padding underneath the squares of matting, which are finished separately with a neat binding. The reception-room is furnished with a sideboard containing richly ornamented appliances for serving tea, which the Japanese offer to all callers. The parlor, among other elegant articles of furniture, has on the floor an elaborately wrought bronze incense burner. Handsome raw silk rugs, which serve for chairs, are laid on the floor.

NEW PUBLICATIONS.

PRINTED SPECIFICATIONS.

We have received from Gustav Hinstorff, Chicago, a copy of specification blanks for brick and frame buildings costing from $500 to $10,000. This, if we mistake not, is the latest publication of the general class to which it belongs. It does not differ in its general features from those which have preceded it, although more care in the consideration of the various items is displayed than in some which have heretofore been noticed. Work is very carefully specified in all particulars, and blank spaces are allowed at proper places for the insertion of those particulars which are peculiar to individual buildings. The specification has a local flavor, so to speak, and is undoubtedly better adapted for use in the neighborhood of Chicago than in the country at large, although very few changes would be necessary to adapt it to general use.

Panel, ⅝ Full Size.

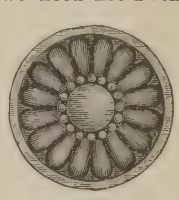
The specification is embraced under several leading heads. The first of these contains a general description of the building and defines the duties of superintendent. Following this are the mason's specification, plasterer's specification, carpenter's specification, painter's specifications and specifications for galvanized-iron work and plumbing. Each of these is on a separate sheet, and the loose sheets are inclosed in a manila cover; accordingly, it becomes a very simple matter to omit any portion or to add extra sheets, as may be made necessary by the peculiarities of the building. Still another sheet included with the specification contains a blank form of agreement, so arranged as to be folded and filed in the usual way. Accompanying the specification is a sample leaf from an architect's certificate book. This book is arranged in the general manner of a check-book, with a stub for recording the amount, date and other particulars concerning the estimate. The printed slip contains a formal certificate such as are commonly issued to contractors during the progress of the work.

Our foreign exchanges notice the completion of the new post office at Paris, France. The cost has been over 9,000,000 francs, or something less than $2,000,000. It has been erected on the site of the old building, which was built in the year 1757. In the lapse of more than a century the French capital has spread out and grown, particularly in a westerly direction, but still the part named remains practically the center of the great city on the Seine. The new building is simply an establishment on a very large scale for the reception, assorting and delivery of the correspondence of the French capital. In the construction of the new post office at Rome, the fresco painter and the landscape gardener were called in to assist the labors of the architect, and accordingly the edifice is one of the most picturesque of modern buildings. In Paris, on the other hand, business requirements alone were considered. One or two improvements have been adopted which might well be imitated in various directions. For example, a large room is set apart for the use of persons who desire to write letters. It is furnished with maps, guide books and directories, and has a supply of pens, ink and blotting paper. An attendant supplies stationary at a small charge, and a few cents are exacted for the use of the room.

The Location of Dwellings.

The *Saturday Review* contains the following hints on the location of dwellings: "When building or looking for a house, one of the most important considerations is the situation. The foot of a hill is always unhealthy; the top of a hill is cold. The best situation, then, is the slope of a hill, and as near the top as is consistent with the obtaining of shelter. But it is essential that the right slope should be chosen. The north-east side exposes the occupants to the coldest winds that blow, while it shelters them from the warmth and light of the sun. The ideally best situation is the southern slope of a not very steep hill. If a hill is too steep, the house can hardly fail to be cold and damp. Hardly less important than the situation of the house is the aspect of the several rooms. A dining-room, for example, should not face westward, nor should a drawing-room, if there is only one, look to the east. A bedroom, again, to be used in the summer, and to which the occupant retires early, should not front westward; while the person who does not retire to rest till the morning should avoid a bedroom into which the early-morning sun pours straight. Every one, however, cannot secure the best situation, but all can avoid the neighborhood of lakes, ponds and stagnant streams, as well as of woodlands, with their carpets of decaying leaves. Having secured the best situation to be had, the next point to be considered is the soil, which clearly should be neither damp nor poisonous. Reference to a geological map is not enough, for dry gravel may have been carted away and replaced by deleterious rubbish; or the soil, though originally wholesome, may have been poisoned by predecessors or neighbors; or, lastly, the house may be damp in consequence of bad construction. Most persons, we venture to think, will learn with surprise that the walls of an ordinary 11-room house may absorb and retain 17,000 gallons of water. Upon the subject of water supply we need not dwell.

Panel, About ⅓ Full Size.



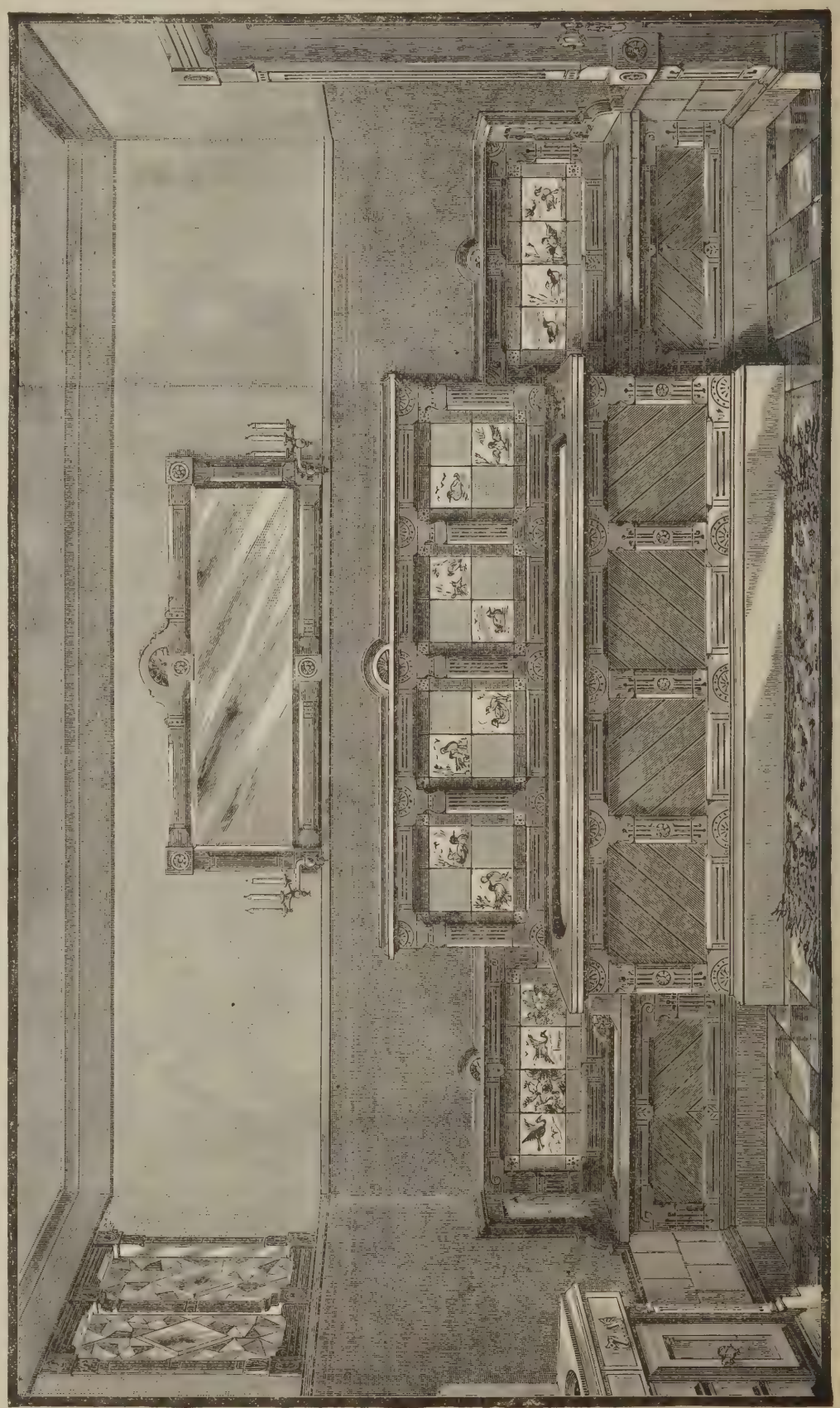
Rosette, ¼ Full Size.

Of all the parts of the question before us it is perhaps the best understood. Neither need we insist upon the importance of proper and effectual drainage. As respects it, the best that the house-hunter or householder can do is to consult a competent sanitary engineer. Having secured a well-situated, well-built and well-drained house, the next point to consider is the ventilation and warming. How to get rid of foul air and how to obtain a sufficient supply of fresh air without causing drafts or making the room too cold are problems which baffle the ingenuity of most householders. Where a house is being newly built, the most satisfactory way of getting rid of foul air is to make a large aperture in the ceiling, opening into an air-tight zinc chamber between the ceiling and the floor above, which shall communicate straight with the chimney, and thus carry off the foul air. In the case of

an old house, the best means, all things considered, is to make an opening into the breast of the chimney."

Bathroom Interior.

The accompanying illustration is taken from a catalogue recently issued by the J. L. Mott Iron Works, New York City, that has been specially prepared for the use of architects and builders. The book is devoted to illustrations of special fixtures and their use in the better class of modern plumbing. The design shows a bathroom about 7½ or 8 feet wide by 12 feet long, containing an "Imperial" porcelain bath or Mott's porcelain-lined bath, also foot or child's bath. The latter, although not so commonly employed as other fixtures in bathrooms, is found to be a very desirable and useful feature. There is also shown a closet which may be taken to represent either of several very excellent articles of this kind which this firm supply. A washstand is shown at the left. The floor is covered with tile, and a mirror with gas brackets above the bath adds greatly to the appearance of the apartment. The woodwork shown may be of mahogany or cherry, and this, in combination with hand-painted tiles, as shown, would produce a very handsome effect. Referring to the book above mentioned, we may say without exaggeration that it surpasses in general quality and disregard of expense everything of the kind that has preceded it. A considerable portion of the volume is devoted to bathroom fittings, interiors of bathrooms, and views, both perspective and sectional, of different fixtures and fittings, all of which serve to illustrate the goods made by this firm. In addition to woodcuts, colored lithographs of "Imperial" porcelain baths are presented, and there are also colored lithographic illustrations of imported washbasins, of which 16 different styles are shown. The catalogue is 14 x 11 inches in size, and is printed on extra thick, finely calendered paper, and the cuts throughout are excellent in quality We understand the work is sent free to architects on application, and also to prospective buyers of first-class plumbing material.



BATHROOM INTERIOR, THE J. L. MOTT IRON WORKS, NEW YORK.

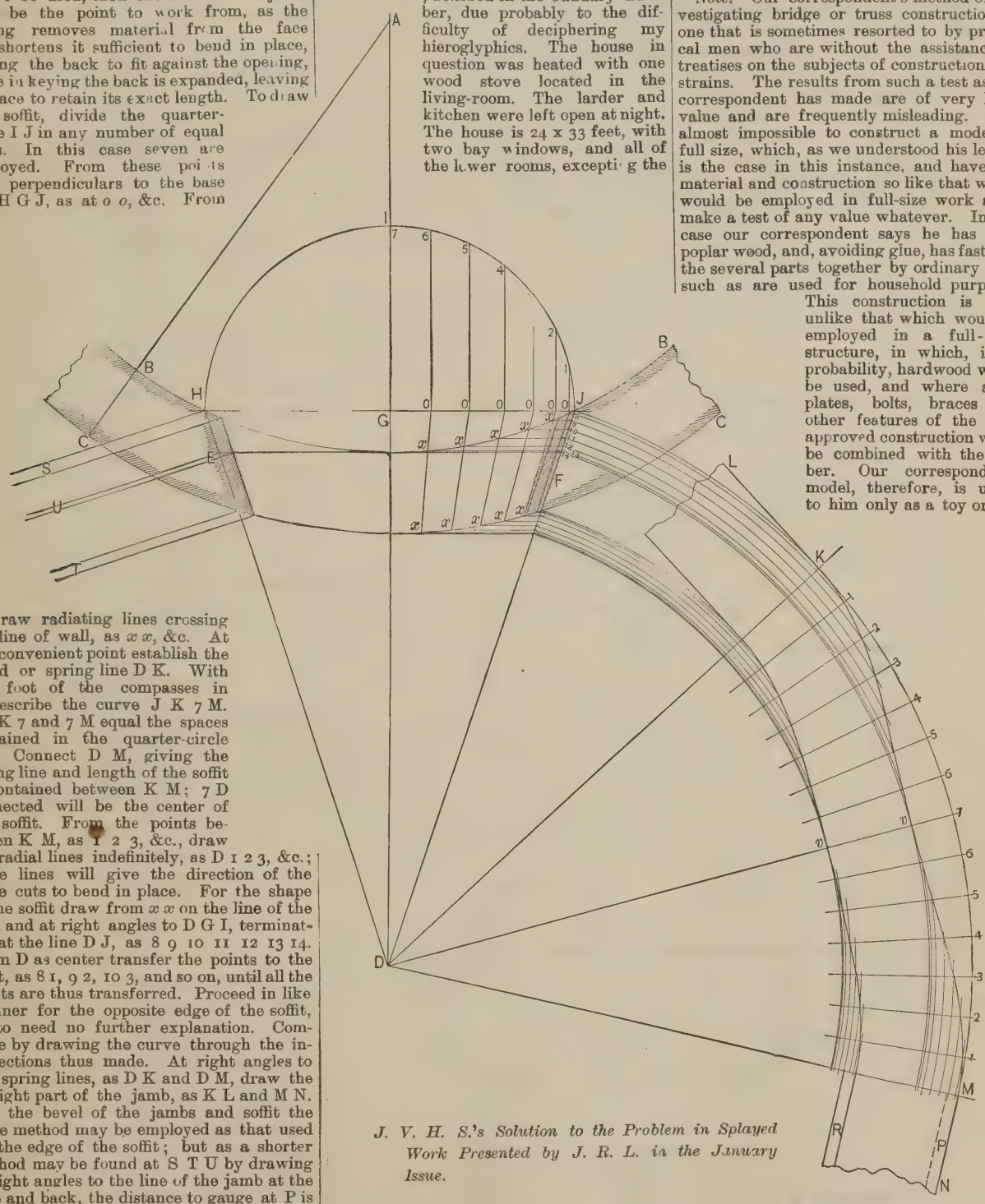
Mr. T. Young, in considering the subject of iron straps in carpentry, says: "When it is necessary to employ iron straps for strengthening a joint, considerable attention is necessary that we may place them properly. The first thing to be determined is the direction of the strain. We must then resolve this strain into a strain parallel to each piece, and another perpendicular to it. Then the strap which is to be made fast to any of the pieces must be so fixed that it shall resist in the direction parallel to the piece. Frequently this cannot be done. In such cases we must suppose that the assemblage yields a little to the pressures which act on it. We must examine what change of shape a small yielding would produce. We must now see how this would affect the iron strap which we have already supposed attached to the joint in some manner which we thought suitable. This settling will perhaps draw the pieces away from it, leaving it loose and unserviceable. This frequently happens to the plates which are put to secure the obtuse angle of butting timbers, when these bolts are at some distance from the angles, especially when these plates are laid on the inside of the angles; or it may cause it to compress the pieces harder than before, in which case it is answering our intention. But it may be producing cross strains which may break them, or it may be crippling them. The strap which we observe most generally ill-placed is that which connects foot of rafter with beam. It only binds down the rafter, but does not act against its horizontal thrust. It should be placed further back on beam, with bolt through it, to allow it to turn round. It should embrace the rafter almost horizontally near the foot, and be notched square with back of rafter."

CORRESPONDENCE.

Splayed Jambs.

From J. V. H. S., *New York City.*—In solution of the problem in splayed jambs submitted by "J. R. L.," of Chillicothe, Mo., a short time since, I present the following: Referring to the accompanying engraving, let A be the center from which the lines of the wall are described, as at B C; let D be the point from which the jambs E F radiate; let G be the center from which the opening H I J in the wall is described; this is also the back of the jamb, and from which the soffit will be drawn and measured, supposing the face to be sawed to bend in place. If the circle is large and keying in the back should be used, then the face of the jamb must be the point to work from, as the sawing removes material from the face and shortens it sufficient to bend in place, leaving the back to fit against the opening, while in keying the back is expanded, leaving the face to retain its exact length. To draw the soffit, divide the quarter-circle I J in any number of equal parts. In this case seven are employed. From these points drop perpendiculars to the base line H G J, as at *o o*, &c. From D draw radiating lines crossing the line of wall, as *x x*, &c. At any convenient point establish the chord or spring line D K. With one foot of the compasses in D describe the curve J K 7 M. Let K 7 and 7 M equal the spaces contained in the quarter-circle J 7. Connect D M, giving the spring line and length of the soffit as contained between K M; 7 D connected will be the center of the soffit. From the points between K M, as 1 2 3, &c., draw the radial lines indefinitely, as D 1 2 3, &c.; these lines will give the direction of the same cuts to bend in place. For the shape of the soffit draw from *x x* on the line of the wall and at right angles to D G I, terminating at the line D J, as 8 9 10 11 12 13 14. From D as center transfer the points to the soffit, as 8 1, 9 2, 10 3, and so on, until all the points are thus transferred. Proceed in like manner for the opposite edge of the soffit, as to need no further explanation. Complete by drawing the curve through the intersections thus made. At right angles to the spring lines, as D K and D M, draw the straight part of the jamb, as K L and M N. For the bevel of the jambs and soffit the same method may be employed as that used for the edge of the soffit; but as a shorter method may be found at S T U by drawing at right angles to the line of the jamb at the face and back, the distance to gauge at P is found at S, for R at T, and for both edges in the center V V at U. Other points may be be established in like manner if desired.

Note.—Our correspondent's demonstration, we believe, is correct, but unfortunately the pattern which he shows, when bent to shape, will not describe the semicircle that forms the basis of the problem. In other words, if there were several windows or openings in a row, all of the same width and hight, one of which occurred, as in this case, on a curved corner, and the given dimensions of the window were assumed as above as the basis of the problem, it would be found that when the work was done the arch of the corner window was not as high as that of the other windows. Possibly our correspondent is aware of this, and may not have supposed this condition entered into the problem. Nevertheless, we think it is required in many cases to make the opening in the curved or corner wall to correspond with those in the straight wall. We are therefore disposed to direct our readers' attention to this point, with the suggestion that the question have still further consideration



J. V. H. S.'s Solution to the Problem in Splayed Work Presented by J. R. L. in the January Issue.

Warm Houses.

From C. J. B., *Minneapolis, Minn.*—An error crept into my remarks on warm houses published in the January number, due probably to the difficulty of deciphering my hieroglyphics. The house in question was heated with one wood stove located in the living-room. The larder and kitchen were left open at night. The house is 24 x 33 feet, with two bay windows, and all of the lower rooms, excepting the front hall only, were kept from freezing by the one wood stove while the mercury stood 30° below zero.

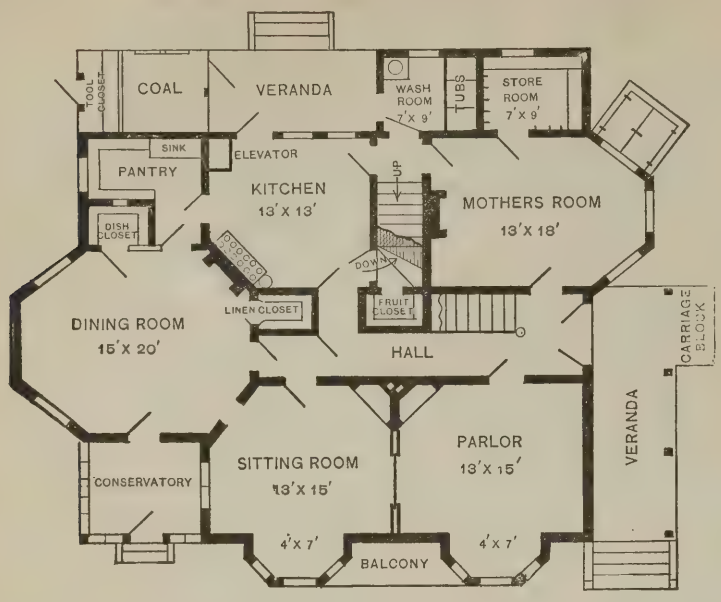
Estimating by Models.

From C., *Palatka, Fla.*—I have lately constructed a model of a bridge span, but do not know how to calculate the strain so as to determine what the span, when made full size, will carry. The dimensions of the model are as follows: Length, 15 inches; top and bottom chord, 1¾ inches. All the parts are ¼ inch thick, built of soft poplar wood. No glue is used. The model is put together with pins such as are used for domestic purposes. The scale of the model is ¼ inch to the foot, and has been constructed without lateral bracing of any kind. I have subjected the model to the following test: I suspended a small platform from it and loaded it with sand, gradually increasing the load until there were 24 pounds in place. At this point the truss began to buckle. With lateral braces it would undoubtedly have supported more. Now what I would be pleased to learn is how to multiply or calculate how much the truss would carry when made full size and loaded under like circumstances.

Note.—Our correspondent's method of investigating bridge or truss construction is one that is sometimes resorted to by practical men who are without the assistance of treatises on the subjects of construction and strains. The results from such a test as our correspondent has made are of very little value and are frequently misleading. It is almost impossible to construct a model $\frac{1}{48}$ full size, which, as we understood his letter, is the case in this instance, and have the material and construction so like that which would be employed in full-size work as to make a test of any value whatever. In this case our correspondent says he has used poplar wood, and, avoiding glue, has fastened the several parts together by ordinary pins, such as are used for household purposes. This construction is very unlike that which would be employed in a full-sized structure, in which, in all probability, hardwood would be used, and where angle plates, bolts, braces and other features of the most approved construction would be combined with the timber. Our correspondent's model, therefore, is useful to him only as a toy or as a study in construction. Its practical use for determining the strength of the full-size bridge is nothing. If he will send us his full name and address, which have been omitted in this letter, we shall take pleasure in forwarding him a list of books on bridge and truss construction, from which he can gain a knowledge of the best plan for putting together work of this kind, and also of the principles underlying a calculation of those strains to which such a framing is subject.

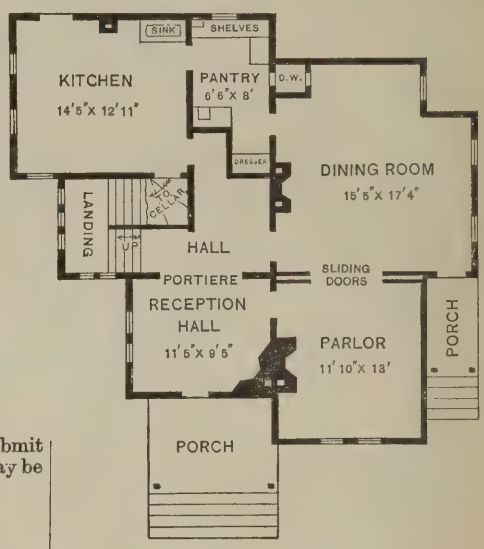
Farmer's House of Ten Rooms.

From FARMER'S DAUGHTER, *Middletown, N. Y.*—As a well-to-do farmer's daughter, in *Carpentry and Building* who have any interest in producing attractive and convenient homes for the families of well-to-do

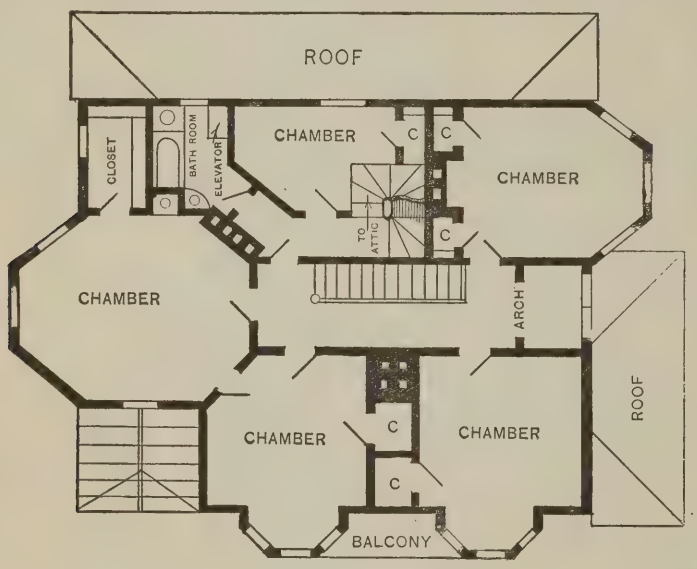


A Farmer's House of Ten Rooms.—First Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.

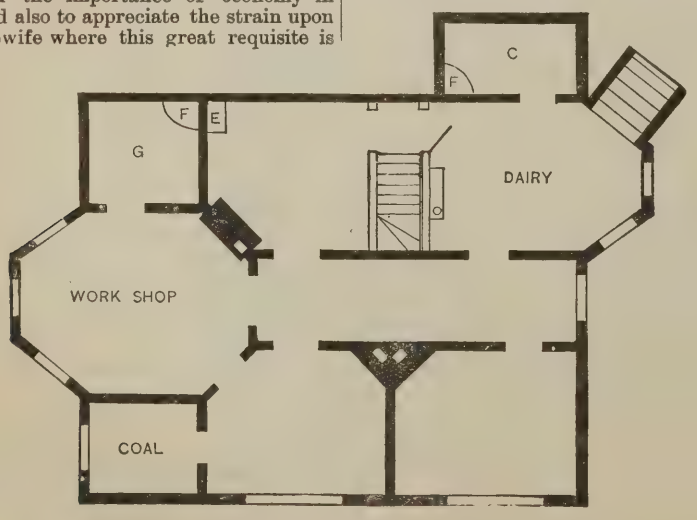
a household where for many years mother and daughters did all the house and dairy work for a large farm, and the noted hospitality of which brought guests in plenty, I learned the importance of economy in steps, and also to appreciate the strain upon the housewife where this great requisite is lacking. At present the old home is being modernized and rebuilt. I have sketched a plan that I would like to have the readers of farmers examine and criticise. I submit the plan in the hope that suggestions may be made that will still further improve it, and thereby simplify labor. It may sound strange to city ears, but the wife of a well-to-do farmer is too often her own servant and dairymaid. The plan submitted herewith has the 10 rooms on the two floors, with stairs to attic, where, for use in busy seasons, additional sleeping-rooms might be provided. Or the attic might simply be used for storage or as a place to dry clothes. I claim for the plan compactness and accessibility. There is no waste space. Each room is entered directly from main hall, and each room can receive its fuel directly from the kitchen through the hall. The plan is nearly square, but the bay windows and the bowing ends of the two rooms on opposite sides of the house give diversity to the general outlines. The rooms



Farmhouse Plans Submitted by W. P.—First Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.

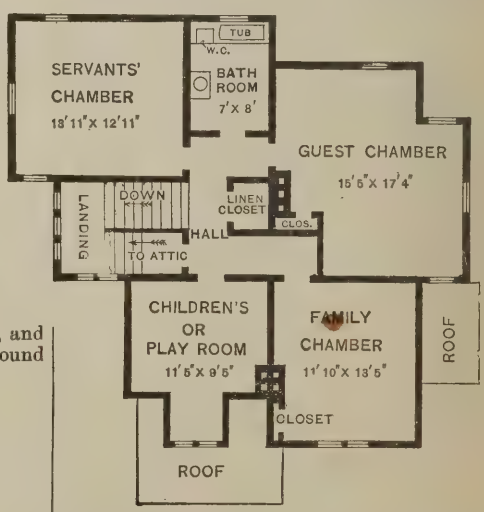


Second Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.



Basement and Cellar.—Scale, $\frac{1}{16}$ Inch to the Foot.

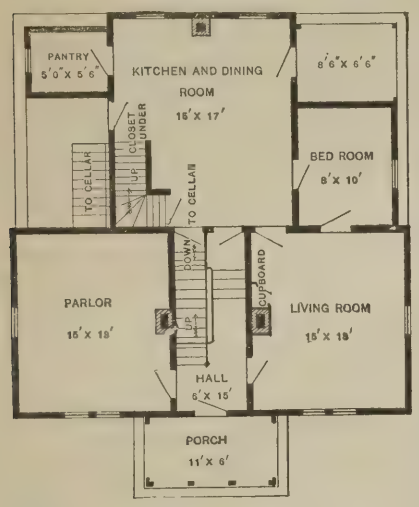
are named, so that a description of their uses is scarcely necessary. The mother's room, which no doubt is the most important room in the house, is of good size, and is provided with a large store or clothes room and an open fireplace. Its nearness to the kitchen, front and back doors and front and back



Second Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.

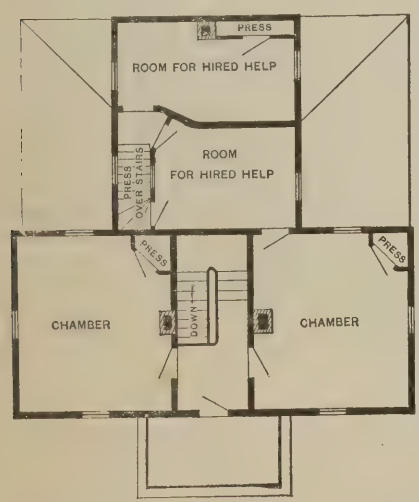
stairs gives it a position to economize steps to the utmost. The kitchen is the only room in the house not having a front outlook. It is provided with a set range and a small elevator running from the cellar. The latter also extends to the second floor, entering the bathroom, and will be found a great convenience in various ways. The convenience of obtaining coal for the kitchen is not the least economical feature shown in the plans. The passage from kitchen to dining-room can be a separate passage, or it may be left open to the pantry. A closed passage from the kitchen to the main hall is provided under the stairs. A fruit closet is also provided under the front stairs, opening out of the cellar-way. A tool closet is provided at the end of the coal bin, opening outward, and will be found convenient for keeping garden tools and storing empty flower-pots

and similar articles. The merits of the side veranda and the location of the main entrance will be appreciated when the fact is recalled that the carriage drive is nearly always at the side of the house, and that not only guests, but members of the family, almost always come and go in some kind of



Farm-House Plans Submitted by J. R. Reed. —First Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.

a vehicle. This arrangement also gives all the front of the house for pleasant rooms, and relegates the forbidding front door to the side. In the second story each chamber is furnished with a closet, and the general arrangement speaks for itself. The bathroom is so arranged as to keep the plumbing in the house in compact shape. The cellar might be partioned as shown in the plan or left open, according to requirements. As many farmers require a milk cellar, one is shown, and, as arranged, this



Second Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.

portion of the cellar is admirably adapted for the purpose. Its accessibility from the outside and also from the kitchen will be appreciated by all who have use for such a cellar. If the house is to be heated by a furnace, the space under the conservatory would make a fine coalroom. One part of the cellar I have marked "Workshop," which would make an admirable place for doing light work in winter time. Uses for the other rooms will readily suggest themselves. If the farm is without a lasting spring two cisterns are often necessary. If made with brick filters they afford the purest water for culinary purposes that can be provided. Their location has not been neglected in the plan, and the spaces marked C and G are intended for them.

Farmhouse Plans.

From W. P., *West Milton, Ohio.*—In response to the general call for farmhouse plans, I send herewith floor plans, which, if considered of sufficient merit, I shall be glad to have you publish. A description of the arrangement is hardly necessary, in view of the fact that drawings are ordinarily quicker read than descriptive text. I should be glad to see criticisms and suggestions of improvement made by readers of *Carpentry and Building*. The most perfect arrangement of rooms in a farmhouse is exceedingly desirable.

From J. R. Reed, *Baymore, Mo.*—I had proposed getting up a special set of plans for publication in *Carpentry and Building*, but my engagements have been such as to make this scheme impossible, and therefore, with the kind permission of my client, Mr. Funk, I send you some plans to which a house has recently been built. A brief description may be of interest to your readers. In this country in farmhouses one room is for the most part used in common for kitchen and dining-room. Especially is this the case in winter. In summer time a detached kitchen is used, and in the house represented in the accompanying drawing the kitchen would be in the form of an extension to the wing or T of the building. Stoves are used in this country exclusively for heating purposes. The flue in the north room extends down into the cellar, with a thimble for a stove, or it can be used for ventilating if so desired. A cellar is provided under the main building only.

Paper for Blue Prints.

From X., *Toledo, Ohio.*—Please inform me, through *Carpentry and Building*, with reference to the method of preparing paper for blue prints. Can material of this kind be prepared as cheaply and as advantageously as it can be bought?

Answer.—In some of our back volumes will be found some general directions for preparing paper for the blue process of copying drawings. When this process was first introduced it was necessary for each person who employed it to prepare his own materials, but since it has come into general use everything pertaining to it can be bought at very reasonable rates and at far less expense and of better quality than can be produced by those who are not expert in the art. It is hardly necessary to occupy space to repeat a recipe which we have already published; besides, in some respects it is now out of date, for various modifications and improvements have been introduced. We advise our correspondent to buy what he requires, and refer him for this purpose to dealers in drawing materials wheverer located. Several advertisements in this line appear in this issue.

Double Dovetailing.

From J. J. S., *Beleville, Texas*—In answer to the inquiry of "J. F. W" published in the January issue, I would state that the last side does not go in last. The two ends and sides are first connected, and

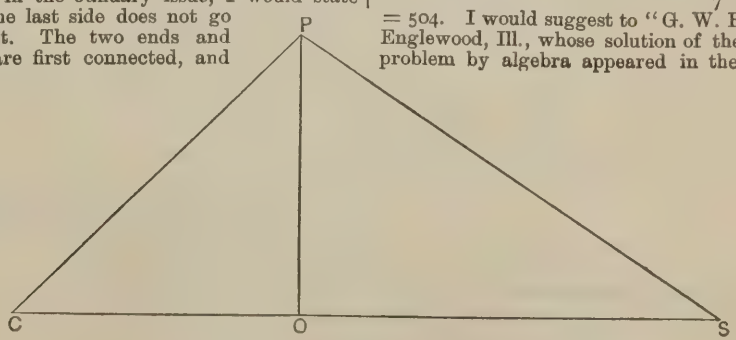
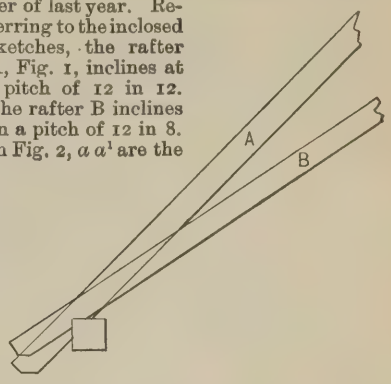


Fig. 3.—Elevation of Pitches.

then the two sections are united. I trust this explanation, with what appeared in my original communication, published in the March number of *Carpentry and Building* for last year, will make the matter fully understood.

Valley Rafters.

From L. H. B., *Corning, N. Y.*—I am perhaps rather late in replying in the matter of valley rafters, but without further remarks I will venture an answer to "J. S. D.," whose question was published on page 223 of *Carpentry and Building* for November of last year. Referring to the inclosed sketches, the rafter A, Fig. 1, inclines at a pitch of 12 in 12. The rafter B inclines on a pitch of 12 in 8. In Fig. 2, a a^1 are the



Valley Rafters.—Fig. 1. of Sketches Accompanying Letter from L. H. B.

plates, and B B^1 the ridge, drawn one-half the width of the building from the plate and parallel with the face of the plate. Draw the line C S in Fig. 3. Square up the line O P at right angles with C S. Make O C equal to O S of Fig. 2. Draw the pitch line C P of a pitch of 12 and 12, thus determining the hight of the ridge at the point P above the line C S. Draw the pitch line P S on the pitch of 12 and 8, thus determining the length of the base line of the roof when a pitch of 12 and 8 is used. Make O B, Fig. 2,

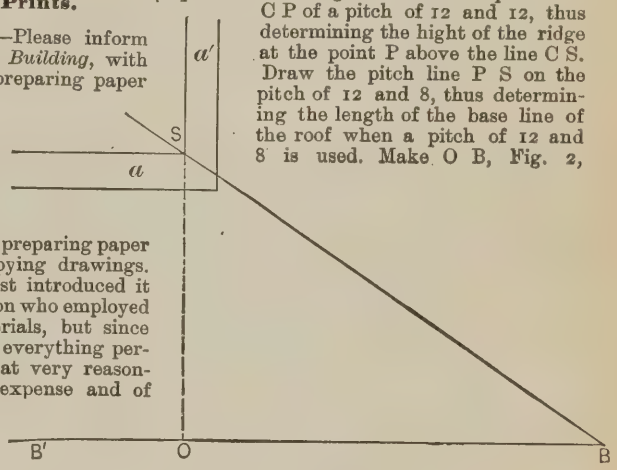


Fig. 2.—Plan.

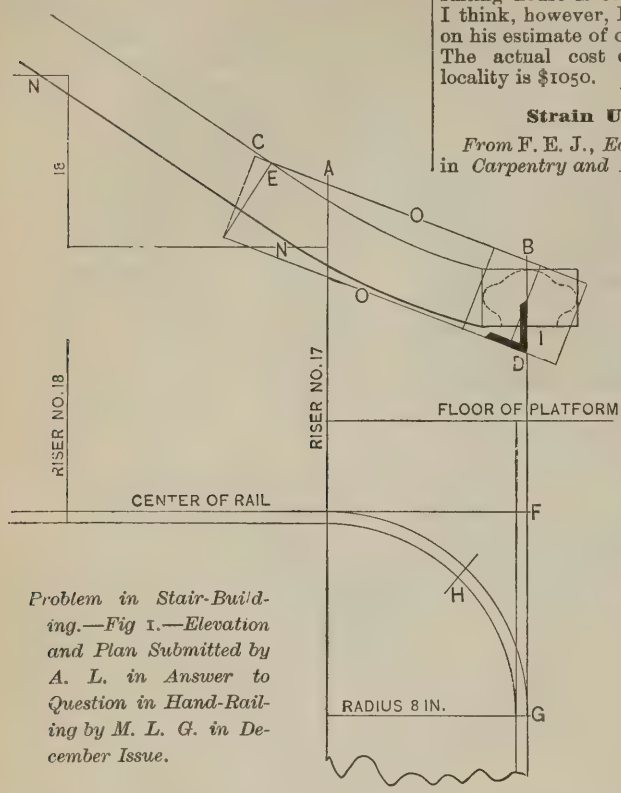
equal to O S, Fig. 3. Join B S, Fig. 2, thus determining the angle at which the valley rafter stands.

Problem in Board Measure.

From J. H. L., *Council Bluffs, Iowa.*—An error occurred in my solution of the problem in board measure published in the January number. I beg leave to make the following correction: After the words "gives the following equation," and in place of what follows to the word "now," which commences the next sentence, insert $\frac{144}{7}(E\,F)^2 = 504$. I would suggest to "G. W. H.," of Englewood, Ill., whose solution of the same problem by algebra appeared in the same number, that if he will carefully look over his equations he will find that they will reduce to x^2 equals 98. This gives 9.9 very nearly as the value of x. This substitution in Equation 1 of his solutions gives the correct answer.

Problem in Stair-Building.

From A. L., *Fairfield, Iowa.*—If your correspondent, "M. L. G.," of Atlanta, Ga., who presented a problem in stair-building a few months ago, had made as many crooks to suit the stairs built by different carpenters as I have during the last eight or ten years he would not think the plan he inclosed at all difficult. If I wanted to be scientific about the execution of the work, and to charge my customer a good round price, I should divide the quarter-circle by making the joint at H of Fig. 1 of the sketches I inclose, but, if I wanted to simplify the work, I would proceed as follows: Make an elevation of two or three steps and risers, as shown in Fig. 1. Let N N be the centers of short balusters and the bottom line of rail. Set the upper bottom line of level rail on the platform, so that the long balusters can be used, as shown at I. Then draw an end section of the rail. Draw the lines O O, which show the thickness of the plank that the wreath must be worked from. The point E may be varied to suit the particular case. The dotted line C shows the end of the block before beveling. To draw the face mold make C A B of Fig. 2 equal to C A B of Fig. 1. Make B G of Fig. 2 equal to F G of Fig. 1 and at right angles to C A B. The bevel for squaring the wreath at G is found at D of Fig. 1 There is no twist at the end of C, but the joints are beveled from the face



Problem in Stair-Building.—Fig 1.—Elevation and Plan Submitted by A. L. in Answer to Question in Hand-Railing by M. L. G. in December Issue.

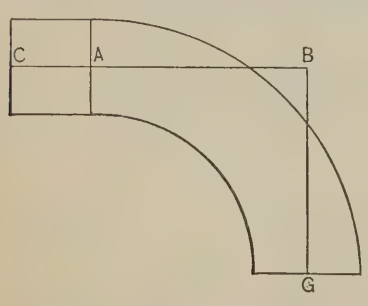


Fig. 2.—Pattern Shape as Described by A. L.

of wreath-piece, as shown at E. The curved lines are drawn in the usual manner. This is a very brief description, but I think it will be understood by the correspondent who submitted the question. It is based on the method commonly known as a spring tangent. In this case the wreath-piece is from pitch to level.

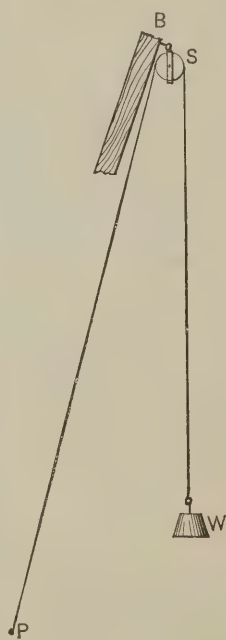
Mr. Bishop's Design.

From C. B. H., *Fort Dodge, Iowa* —I built a cottage from the plans and details of Mr. S. A. Bishop, published in the April number of *Carpentry and Building* for last year. I found the plans very correct, and the resulting house is convenient and handsome. I think, however, Mr. Bishop is a little off on his estimate of cost and bill of materials. The actual cost of the building in this locality is $1050.

Strain Upon Derricks.

From F. E. J., *East Ridge, N. H.*—I notice in *Carpentry and Building* for February a question relating to the strain upon derricks, using simple and compound pulleys. I submit an answer to the question, with its demonstration, and trust it will prove interesting to the readers of the paper. The question is whether there is more strain on a derrick when raising a given number of pounds with a single rope than with a double block and tackle. The simplest way to get at an understanding of this problem is to take illustrative examples of the two cases and notice the laws which govern each case. In Fig. 1, B represents the end of the jib, to which the simple pulley S is attached. The weight to be raised is represented by W, and the lifting power by P. Now suppose, for example, that the weight W is 100 pounds; then, evidently, 100 pounds will need to be applied at P to counterbalance W. In that case the down strain at B will evidently be the sum of the two strains W and P, or 200 pounds.

Now let us introduce a second pulley, as V in Fig. 2, making a compound tackle, and note the results. Let the weight W, which is attached to the pulley V, represent 100 pounds, as in the previous instance. The pulley is supported by the two portions of the rope C and D which are connected with the pulley S, the end C being fastened to the hook of the pulley S, and the end D passing over the pulley S to P, where the power is applied. As the two portions of the rope C and D together support the weight W, which is 100 pounds, it is evident that each will support one-half of the weight, or 50 pounds. The downward strain, then, on the pulley S and the jib B from C and D will be 100 pounds, but D is held from falling away by a force applied at P. This force will necessarily be equal to that sustained by D, or 50 pounds. Accordingly, the whole downward strain exerted upon the block S, and therefore upon the jib B, will be equal to the sum of the downward strains of the portions of the rope D, C and P, each equal to 50 pounds, or altogether 150 pounds. This is but three-fourths of the strain or weight exerted upon B in the first instance.



Strain on Derricks.—Fig. 1.—W = 100 lbs. P = 100 lbs. Strain on B = 200 lbs.

Of course, with the increase of the number of pulleys the strain can be reduced more and more. In this demonstration the weight of the extra pulley is left out of account. This must be added to the 150 pounds, in the case supposed, in order to give the true proportion. The demonstration proceeds upon the supposition that the weight and power are in equilibrium, but the rule holds equally well when the weight is in motion, except when the friction of the ropes is enough to be taken into account. This element would be the greater the more pulleys there were employed, but practically it may be stated, as a rule, that the more pulleys employed the less will be the strain upon B

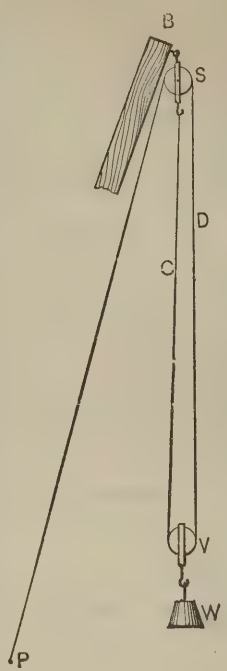


Fig. 2.—W = 100 lbs. P = 50 lbs. Strain on B = 150 lbs.

The case of the least strain upon B that would support W would be when a rope is attached to B alone. In this case the strain would evidently be the weight of W, or 100 pounds. In the first two illustrations the jib is represented as nearly vertical, and the reasoning is based upon the supposition that P and W both act vertically. As the jib approaches the horizontal it is evident P and W will no longer act in the same line, but in directions more diverse. As the jib approaches a horizontal position the direction of the strains will no longer be vertical, but will lie in a direction between the two lines, as indicated by *a t* in Fig. 3. In this case the total strain upon B would be reduced, but would still be greater under the conditions of the first example than in the second.

From A. S. J., *Pittsburgh, Pa.*,—In the February number of *Carpentry and Building* a correspondent asks with regard to the strain on a derrick when using a single block, and also a double block and tackle, when raising a given number of pounds. I would say that the double block will produce less strain on

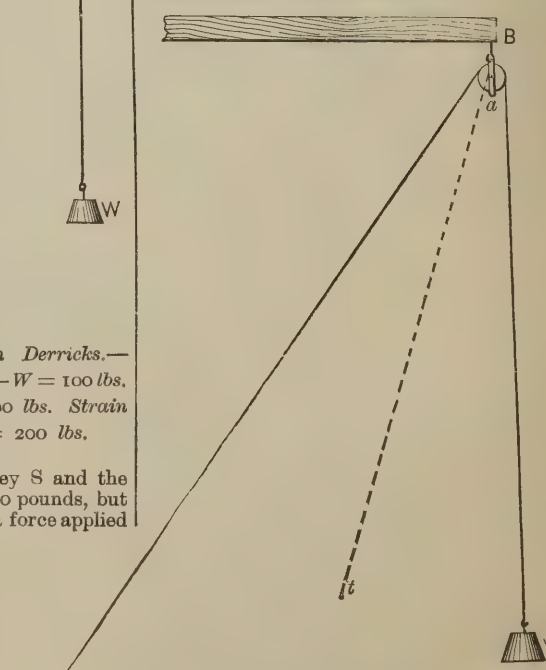


Fig. 3.—The Line a t Shows the Direction of the Resulting Strain, with Weight at W and Power at P.

the derrick than a single block. For example, suppose a weight of 150 pounds is attached to a single block. A man weighing 155 pounds by hard work can raise the weight. Change the arrangement and put in a double block. The same man can stand and pull the weight up with no great exertion. From this it is to be argued that the derrick has as much less strain upon it by the second arrangement as the difference in the weight exercised by the man in raising the load. Two thousand pounds, for example, can be raised with much less power on a three or four wheel block than upon a two or three wheel block. It is evident, therefore, that the weight or strain of double blocks is less than of single ones, and that the derrick escapes a corresponding amount of strain.

From D. M. W., *Caledonia, Mich.*—I notice the question asked by "G. F." in the February issue of *Carpentry and Building*. In reply I would say that there is a great deal more weight on the derrick when block and tackle are employed than when a single rope is used. With tackle using five pulleys, for example, there is five times as much friction as with one. Just what the increased weight is depends in a great measure upon the size of the ropes and pulleys employed. If a 2-inch pulley and an inch rope are used, it will be found that a great deal more power will be required to raise a given weight than if the pulley were 10 inches in diameter. This is not because one pulley is larger than the other, but rather because the rope does not need to bend as short over one as over the other. Ropes are worn out principally on account of the short bend they make on going over the pulley. A rope will last much longer when used on a large pulley than on a small one. In my tackle and derrick, which was described in the May number of *Carpentry and Building* for 1884, it takes the strength of a strong man to pull the slack out of the ropes, while if but one pulley was used a few pounds would do the work. These facts are presented in the light of long experience in handling ropes.

Second Prize, Twelfth Competition.

From P., *Jacksonville, Ill.*—The excellent design presented in the December number, being the second prize in the Twelfth Competition, has one serious defect. The wall of the second story extends over the kitchen ceiling, and any timbers or supports for it must necessarily rest above the kitchen window nearest the sitting-room. The author of the third prize design gets over this difficulty by running the roof straight down from the ridge, thus saving the expense of rear wall. This plan does not give as pleasant an appearance, however.

Planceer to Circular Bay Window.

From C. J., *Omaha*—In answer to a correspondent from Cambridge, Ohio, who inquired in the January number how to get the lines for springing a planceer around the cornice of a circular bay window, I would say that the radius of the planceer is the square root of the sum of the squares of the elevation of the roof and radius of window to points of rafters. In this case it will figure 12 feet 8¾ inches.

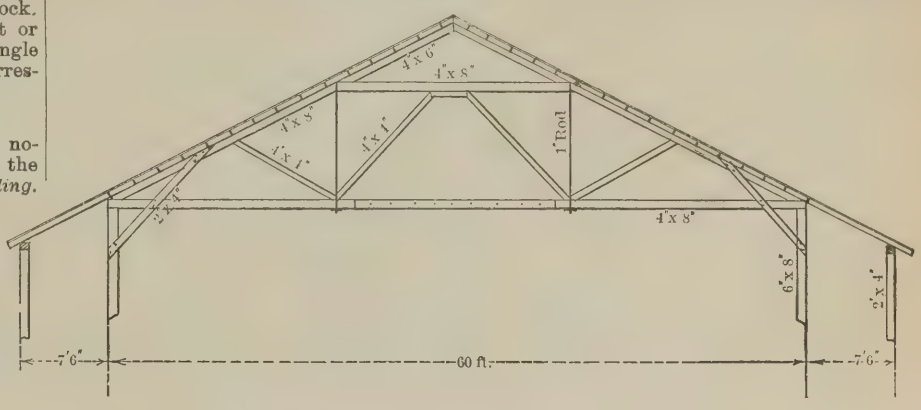
Deadening Floors.

From J. M., *Belmont, Wis.*—For the benefit of "T. F. V.," who asks for a method of deadening floors, I would suggest that if the ceilings above the storerooms in the building in question are of matched stuff he may take it off and put in light ceiling joists midway of those now in place. Let their lower edges extend downward 3 inches below the floor joists. Complete the ceiling by nailing to these joists, and cover it 2 or 3 inches deep with sawdust. If the ceilings are plastered, a false ceiling may be put in below the present ceiling without removing it. In case this is tried, the new ceiling should not touch the old or be directly connected with it in any way.

REFERRED TO OUR READERS.

Roof for Skating Rink.

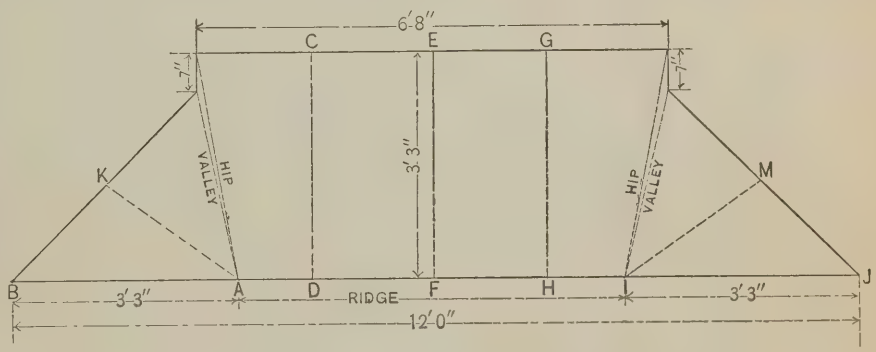
From J. W. M., *Newark, Ohio.*—I inclose a sketch of a roof truss used on a skating rink in this place, which was recently opened to the public. I desire to ask the practical readers of the paper to forward their opinions regarding the strength of the roof and the desirability of such a truss for use. The rink is 75 x 140 feet in plan. The trusses are placed 14 feet apart. The purlins are 2 x 6, and are set 2 feet apart. The rafters over the galleries are 2 x 4 inches, set 2 feet apart, and at the upper ends are spiked into the lower purlin which lies at the foot of the trusses. The tie beam is spliced in the middle by bolting a 2 x 8 timber on each side. The braces at the foot of the truss are spiked on both sides. The roof is sheeted with ⅞-inch pine boards nailed on to the purlins parallel with the rafters and covered with No. 26 iron roofing. The dimensions of the timbers are marked on the sketch.



Framing of a Rink Roof.—Diagram Accompanying Letter from J. W. M.

Hip and Valley Rafters.

From C. A., *Chicago.*—I would like to learn from some of the readers of *Carpentry and Building* how to obtain the correct profile and backing lines of the hip and valley rafters, also how to get the profile of rafters A K and I M, indicated upon the inclosed plan of an octagon bay window. The profile of a regular rafter is given, which, it will be seen, is an "O G" or double curve in character.



Hip and Valley Rafters.—Fig. 1—Plan Accompanying Letter from C. A.

Ice Rink.

From S. D. L., *Ancosta, Ontario.*—Now that the subject of rinks is being discussed, will some reader of *Carpentry and Building* furnish plans for an ice rink suitable for curling and skating, the size to be, say, 50 x 160 feet, and to be provided with a gallery at one end over cloak-rooms, &c., the cost not to exceed $1500?

Church Spires.

From W. R. J., *Tracy, Minn.*—I have taken *Carpentry and Building* for a number of years, and have been a careful reader of the numbers as they have come out. So far I have failed to notice anything in it pertaining to raising church spires. Will not some practical reader furnish a communication on this subject? I believe that is customary to build church spires on the ground, or, at least, get the timbers ready and then to raise them up through the tower, but just how this is most conveniently or practically carried out I am not informed. I desire to know more about it.

Glass Front.

From C. K., *Griffin, N. Y.*—I shall be glad if some practical reader of *Carpentry and Building* will give me the best method of putting in and finishing a glass front for a store. The building in question is 28 feet wide, and the glass is 11 feet in the clear. Double doors occur in the center.

Frozen Mortar.

From J. H. P., *Emporia, Kan.*—I desire to inquire of the practical readers of *Carpentry and Building* with reference to their experience with frozen mortar for plastering. Will it do to use frozen mortar after it thaws, as well as if it had been fresh. I have a building with a scratch coat on and well dried. The brown coat is in the box, and at the time of writing this letter is frozen as hard a rock. The owner thinks it will not do to use the frozen mortar, and I am not sure in the premises. I shall be glad to hear from practical readers of the paper.

Hanging Grindstones.

From J. J. H., *Pittsburgh.*—I desire to inquire of the readers of *Carpentry and Building* for the best and simplest method of hanging grindstones for carpenter's use. How are the true centers to be struck, so that the stone shall run true; also, when the face gets a hard, smooth surface on it, what is the best way to get it off so that it will cut well?

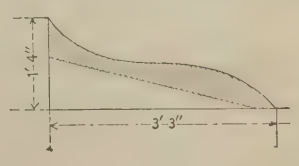
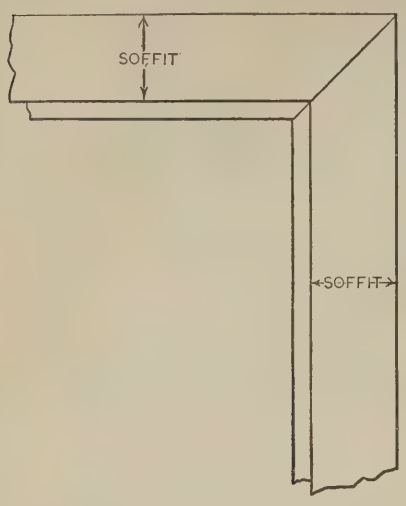


Fig. 2.—Profile of Rafters A B, C D, E F, &c.

Soffit Bevels.

From J. D. R., *Syracuse, N. Y.*—I have been looking for a rule for getting



Soffit Bevels.—Fig. 1.—Plan of Soffit.

the correct bevels for the cuts of soffits when placed at different angles. I inclose a sketch to explain what I mean.

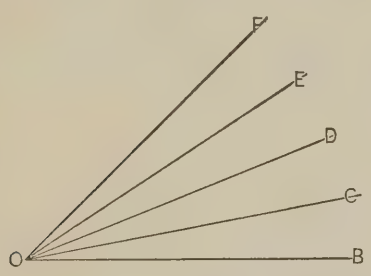
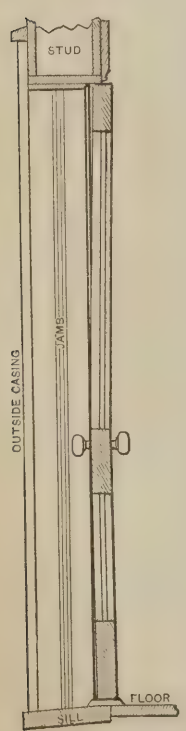


Fig. 2.—Angles of Splay of Soffit.

O B is a level line. O C, O D, &c., show the given pitch. What I desire to know is how by lines I can get the correct bevels, both vertically and horizontally, when the soffits are placed as indicated by the lines O C, O D, &c.



Door Drawn in at Top and Bottom by Heat in a House in Winter.

Springing Outside Doors.

From C. A., *Chicago.*—Will some reader of the paper inform me of a good way of preventing an outside door from springing inward at top and bottom during the winter? I find that doors are inclined to do this, and that they remain in the shape so assumed during the summer until the next winter, and then spring in still further. I know of two doors, one of them 2 feet 8 inches by 6 feet 8 inches, 1⅜ inches thick, hung with three 4½ x 4 inch loose-joint butts, the other 3 feet by 7 feet 6 inches, 1¾ inches thick, hung with three butts, which are sprung ¾ inch at the top. The inclosed sketch indicates how the doors are sprung. The two doors above-mentioned were hung, with hollow side out, about two years since. I would also like to know whether it is possible to prevent inside doors from swelling in summer and shrinking in winter.

TRADE NOTES.

The Stanley Rule and Level Company have recently brought out a handsomely illustrated show card containing a full description of their specialties in the line of improved carpenters' tools. They have named it "The Wood-Worker's Companion." It is appropriately mounted for hanging, and would grace the space over any mechanic's work bench. The company offer to mail a copy to any wood-worker who will send a request for the same, either to the factory in New Britain, Conn., or to the New York office, No. 29 Chambers street. The card is unusually attractive and contains as a center piece a general view of the shops at New Britain, Conn. It is done in colors, and is a fine specimen of typographical art.

Messrs. Auld & Conger, of Cleveland, Ohio, inform us that they have secured an injunction in the United States Circuit Court temporarily restraining Francis R. Marks, of Ashland, Ohio, from continuing the manufacture and use of certain machines claimed to be infringements on patents controlled by them. The petition in this suit asked for a perpetual injunction and the damages allowed by law in infringements under the patent laws. The above indicates the result of the first move by this firm to establish their rights under their patents. We are informed that they are about to commence other suits for the same purpose.

Messrs. M. Ehret, Jr., & Co., with offices at Philadelphia and St. Louis, Mo., advertise themselves as the largest coal-tar distillers and refiners in the United States. One of their circulars shows a tank 90 feet in diameter and 26 feet high, having a capacity of 30,000 barrels. Their works have a capacity of 120,000 barrels annually, with a tankage capacity of 90,000 barrels. The special goods manufactured by this firm are tarred felt, both two and three-ply, roofing pitch, paving composition, asphalt cement and asphalt paint for roofs. A recent circular addressed to builders directs attention to the advantages of ready-made roofing of the general kind above mentioned over shingles.

The C. L. Sieb Mfg. Co., Room 7, Domestic Building, corner Fourteenth street and Broadway, New York City, are directing attention to burnished gold and silver letters which they are manufacturing and sending out to painters and others in shape ready to apply to glass, wood, iron, wire screens and in other positions. The letters have a backing of tinfoil, on which more or less gold-leaf is used on the side exposed to view. The reflecting surface is obtained by the use of mica, and various color effects are produced by the use of paint. The letters are sent out temporarily fixed to a backing and are put in place, upon glass for example, by simply varnishing their edges and laying them against the glass while still fastened to the backing above mentioned. The latter is afterward removed. They claim for these goods that they are the only burnished letters that will last on glass, and also that they are the only ones than can be sent by mail and applied by non-experts.

We noticed some time since the illustrated pamphlet published by the H. W. Johns Mfg. Co., No. 87 Maiden Lane, New York, for free distribution, entitled "Structural Decoration." We understand that this pamphlet is still having a very wide circulation. It is one of the most useful trade publications which has recently been put out, and treating, as it does, on a question that is constantly arising in house building, and serving the purpose in an efficient manner, it is greatly appreciated. The selection of colors for a building is at best an undertaking of no small moment unless one is an experienced painter and decorator. Accordingly, anything that assists by showing desirable combinations and striking contrasts is greatly to be prized.

The Brick and Stone Water-Proofing Company, with offices at No. 55 Broadway, New York, have issued a pamphlet describing the Caffall process of water-proofing for brick, stone, terra-cotta, stucco and for interior walls. This water-proofing is pronounced invisible, impenetrable, insoluble and imperishable. The pamphlet contains a general description of the method of application and a statement of the advantages to be derived from its use. There is also published a certificate of R. Ogden Doremus, M. D., LL.D., professor of chemistry and physics in the College of the City of New York, concerning certain tests and expert examinations made of this material. A similar certificate from Charles M. Cresson, M. D., of the Philadelphia Bureau of Experiments and Chemical Laboratory, is given. Several pages are devoted to selections from opinions received from those who have examined or employed the process. The pamphlet contains much that is of interest to architects and builders.

The Lincoln Iron Works, of Rutland, Vt., have sent us their catalogue devoted to wood and stone working machinery, in which they call attention to their special facilities for building and equipping mills. The catalogue is attractive in every respect, the numerous cuts being well executed and the reading matter conveniently arranged. Among the machinery shown we find the Merriman stone planer, a stone-jointing machine, the "Little Giant" dowel machine, the "Eclipse" rock drill, the Ingersoll channeling and gadding machines and others.

We have received from the Cincinnati Corrugating Company, Cincinnati, Ohio, a copy of the new edition of their pamphlet describing the goods they manufacture. The frontispiece shows a general view of the establishment, which is a substantial three-story building sided and roofed with corrugated iron. A ventilator in the form of a monitor extends lengthwise of the building and affords ventilation to the rooms below. The width of the factory is 75 feet, while its depth is 200 feet. The illustrations in the book, showing the application of corrugated iron and describing the different goods made by this company, are of interest to all who have occasion to use material of this character. The diagrams of measurement where orders are sent in we have heretofore commented upon. They are carefully devised and cannot fail to be of advantage to all who have occasion to deal with the company.

Messrs. Redding, Baird & Co., successors to Cook, Redding & Co., with offices at 146 and 148 Franklin street and 149 Congress street, Boston, are directing attention to their stained and cut glass work. This firm make a specialty of church and ornamental windows executed to order, and also furnish domestic stained glass to dealers, as may be required.

Messrs. Auld & Conger, of Cleveland, Ohio, inform us that they have recently contracted for 23 mantels and grates to be used in the new Saving and Trust Company's building in that city, and that they have recently furnished 44 mantels for a block of houses built by Mr. D. Baldwin, of that city, and 36 in another block built by Mr. Doan. Their trade in mantels, grates, roofing slates and other supplies is on the increase.

We have received from the New England Decorating Machine Company, Nos. 632 and 634 Harrison avenue, Boston, Mass., a pamphlet containing specimen sheets of carved ornamental designs in walnut, mahogany, cherry and other woods. The designs shown are of the kind commonly described as embossed, although they are worked to a depth not ordinarily obtained by the embossing process. The strips of wood on which the designs are worked are subjected to heavy pressure under dies containing the desired form. The company claim for these goods a degree of beauty not attainable by handwork, and unequaled by anything heretofore presented for quality of design and elegance of finish. The pamphlet before us contains for the most part designs of trimmings adapted for use in cabinet work, organ cases and other similar places. We understand that the company are prepared to furnish special designs when required, and to make work of any reasonable size. A number of the designs submitted are full size, and show in a very satisfactory manner the quality of the work.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

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Washington Market.

The accompanying illustration shows one of the side gables in the new Washington Market building, recently completed in this city. The engraving was made from photograph by a process that is notable for its fidelity to nature, since there is no intermediate penwork. The negative was taken before the snow of one of the late winter storms had all melted, and two small drifts remaining behind some of the work are clearly shown in the engraving. The building of which this is a part is characteristic of modern construction in many respects. The demands made upon the architect included a maximum of room, light and ventilation with a minimum space consumed by construction as well as the smallest amount of material. Iron and glass are the principal materials used, and how they have been managed is clearly shown in the engraving. The framework of the building is of wrought and cast iron, while the exterior finish is of wrought and galvanized sheet iron. The effect of some of the panels is increased by the judicious introduction of terre-cotta work. The tympanum panel of the gable, including the medallion-head, and also spandrel panels lower down, are examples of this kind of finish. The roof is of slate, with sections of glass, while the top of the ventilator running lengthwise is also of glass. The building occupies an entire square bounded by Vesey, Washington, Fulton and West streets. The sidewalk surrounding the building is also inclosed and is occupied by some of the market tenants. The roof of this portion is of corrugated galvanized iron, while the upper portion of the sides is of the same material. The lower part is done in wrought and cast iron panels, thus giving stability to those portions having the hardest usage. The architect of the building is Douglas Smyth, New York City.

ONE OF THE SIDE GABLES IN THE WASHINGTON MARKET, NEW YORK.—DOUGLAS SMYTH, ARCHITECT.

Good Bricks and Brickwork.

There are certain criteria of good bricks, which, being infallible and readily applied, constitute the best practical tests as to the quality of these valuable materials. In the first place, good bricks are always heavy—always solid and compact, ringing with a clear, sharp sound when struck together, and well and truly formed, with nice, sharp edges. Neither will they absorb much water. If you have to choose between two bricks of equal or nearly equal weight, immerse them in water after weighing them dry. Twenty-four hours after take them out and reject the one which has acquired most weight, and therefore imbibed most water. Overburned bricks may be heavy, but they are also cracked and distorted in form by undue heat, and may be readily distinguished from the better sort by their general appearance. Bad bricks, on the contrary, are light, will not ring at all when struck together, are ill-shaped, hollow on one side and round on the other, readily abrade on the edges, suck up water like a sponge, and indeed are sometimes so soft that a strong thumb may force off the edges, such as they are.

Good brickwork is laid truly and accurately to a level, every joint answers truly to the line, and every part of the face coincides with the plumb. All the beds and joints are well filled with mortar until it is fairly pressed out in the faces, all deficiencies are carefully pointed up as the work proceeds, and the whole well flushed in course by course. The mortar is well mixed, lime and sand thoroughly blended, and the sand, if handled alone, is found to be clean and sharp to the touch, feeling thoroughly gritty, and free from all slimy, greasy and tenacious qualities. The joints are never to exceed ⅜ inch and should never exceed ¼ inch in thickness, and the vertical lines must be truly plumb over each other in such courses as intended, according to the kind of bond employed. The work is also carried up uniformly level throughout, and no difference permitted, even for a temporary purpose, under any circumstances whatever. By these means only can unequal settlements be prevented. Contraction of bulk or settlement we know must occur from the combination of materials in an expanded condition, as mortars and cements are, when in a plastic form, and, therefore, all walls must sink or settle down as the mortar becomes dry; but it is essential to prevent dislocation that this settlement be uniform throughout, and this can only be secured by adopting the precautions prescribed above. For the same purpose the back and interior of the work must be

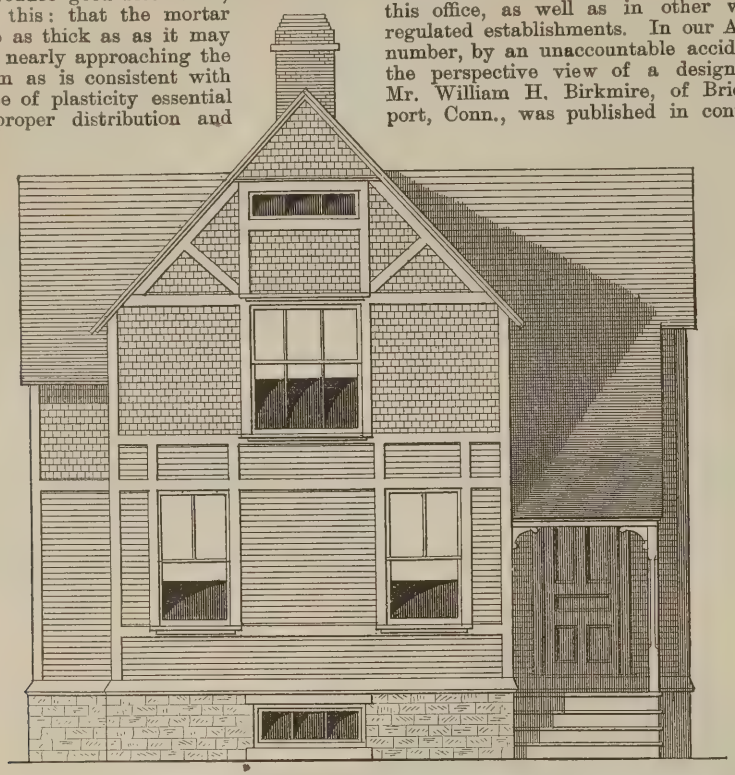
brought up, laid and finished as completely as the front, and no gaps or crevices left for subsequent patching. One other rule has to be observed, and we reserve it to the last and separate and emphatic statement to show our estimate of its importance in order to produce good brickwork, which is this: that the mortar should be as thick as as it may be, or as nearly approaching the solid form as is consistent with the degree of plasticity essential for its proper distribution and penetrating into the joints, while the bricks should be thoroughly wetted on the surface. By these means the adhesion between them is rendered the more perfect, and the subsequent amount of shrinking and settlement is reduced to a minimum. The watery mortar, on the contrary, suffers extreme contraction, while the essential properties of the lime are actually dissipated, and when the wall becomes thoroughly dried, if ever it does, little remains in the way of cement but the sand compounded with it.

Measuring Timber.

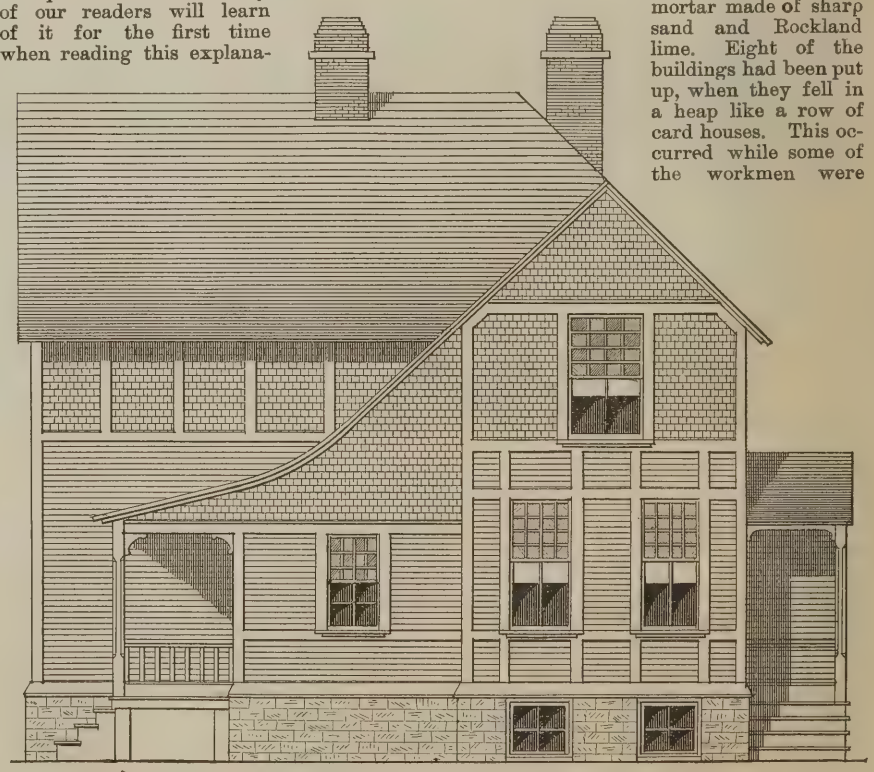
On the subject of measuring timber Mr. R. Murray, an English writer, gives the following general particulars: "In measuring standing timber the length is taken as high as the tree will measure 24 inches in circumference, less than which measurement is not considered as timber. At half this hight the measurement for the mean girth of the timber in the stem of the tree is taken; one-fourth of this girth is assumed to be the side of the equivalent square area. The buyer has in general the option of choosing any spot between the butt end and the half hight of the stem as the girding place. All branches as far as they measure 24 inches in girth are measured in with the tree as timber. An allowance, which varies according to circumstances, is generally deducted for the bark. In oak it is from about one-tenth to one-twelfth of the circumference at the girding place; in other sorts of timber it is less. In all, however, this allowance depends much upon special agreement. It is usual to speak of timber by the load, which means 50 cubic feet of squared timber, or 40 cubic feet of rough timber. A load of plank is dependent upon its thickness. Thus, it will require 200 square feet of 3-inch plank to make the load of 50 cubic feet; therefore, the load of plank is the number of square feet of its respective thickness which is necessary to make the load of 50 cubic feet. Deals are measured according to their thickness and lengths, by the hundred, reckoning 120 to the hundred."

Small Cottage.

It is not often that the Editor of *Carpentry and Building* is called upon to apologize to his readers for mistakes in the printed pages of this journal. Nevertheless, it seems that mistakes occur in the management of this office, as well as in other well-regulated establishments. In our April number, by an unaccountable accident, the perspective view of a design by Mr. William H. Birkmire, of Bridgeport, Conn., was published in connection with the elevations and details of a house designed by Mr. Alexander Millar, of Washington, D. C. Those who scrutinized elevations and perspective together have no doubt detected the error, although we are persuaded that many of our readers will learn of it for the first time when reading this explanation. Perspectives are ordinarily considered of secondary importance by our practical readers. We present herewith the elevations and details furnished by Mr. Birkmire, and must refer our readers to the April number, as above mentioned, for the perspective view. The fact that we did not engrave a perspective view of Mr. Millar's cottage accounts in some measure for the accident we have mentioned.



Cottage Design by Wm. H. Birkmire, Bridgeport, Conn.—Front Elevation.—Scale, ⅛ Inch to the Foot.



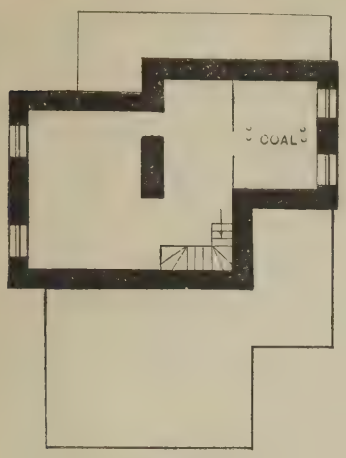
Side Elevation.—Scale, ⅛ Inch to the Foot.

Mr. Birkmire's design contemplates a small and compact house. The arrangement of the plan is such as to cause very little waste room and to embody many conveniences. The rooms are so arranged that the hall can be reached from each. The stairs are made closed as an item of economy. They start with a few risers in the hall, the lower steps being finished with a newel and balusters. The studs are 15 feet long in the main portion of the house, measuring from sill to wall plate. The cornice and gutter are made simply and economically with a small stop at end of sheeting boards for finish. The only plumbing employed is the cold-water supply to sink and the drench for the conductors. The house is intended to be plastered throughout and the finish to be of white pine painted. The author contemplates a cellar under the kitchen and dining-room, well lighted and airy, with stairs leading from small hall on first story. He suggests that the shingles in second story and for the roof of the house should be dipped in oil, colored with Venetian red, for the purpose of giving them tone. No further painting of the roof would be required. The author's estimate of the cost of this building at present prices is in the neighborhood of $1500.

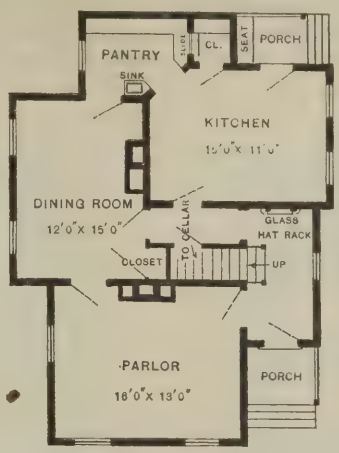
NOTES AND COMMENTS.

Oue of those terrible building accidents which occasionally occur in the large cities where speculative building is done occurred in New York some two weeks since. Plans were filed at the Building Department in November last for a row of 24 houses to be erected on the south side of Sixty-second street, between Tenth and Eleventh avenues. The houses were to be double family flats, 25 x 83 feet and five stories high. The plans were prepared by G. W. Spitzer, and Chas. A. Buddensiek was the builder. The cost was to be $18,000 for each house. At the Building Department it was understood that the houses were to have a solid rock foundation, and were to be built with hard brick, laid up with mortar made of sharp sand and Rockland lime. Eight of the buildings had been put up, when they fell in a heap like a row of card houses. This occurred while some of the workmen were busy finishing them, and others were busy trying to prop up a wall which had given evidence of instability. The wreck was complete. Not a stick remained standing and not a timber whole in the buildings. Half a hundred workmen were in or about

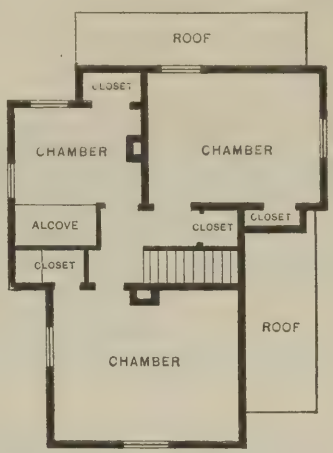
the buildings at the time. Sixteen were hurt, a number fatally. An interview with one of the sub-contractors with reference to the material employed in these buildings, and particularly with reference to the mortar, is thus reported in the daily papers :



Foundation.



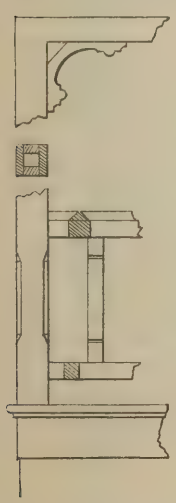
First Floor.



Second Floor.

Foundation and Floor Plans.—Scale, $\frac{1}{16}$ Inch to the Foot.

"It was made of Jersey lime and the loam you can see in the street. There was just one load of sand brought there. It was used by the hod carriers to put in their hods before they filled them with mortar, so that when they dumped the mortar out the hods would be clean of the mud. The walls stood up pretty well as long as the frost was in the mortar, but when the rain and warm weather came they began to wabble. The beams were supposed to stick at least 4 inches into the walls, but I could put my trowel in edgeways between the end of the beams and the brick in many places. I saw a great many beams that did not rest more than ¼ or ½ inch on the brick. I said to my side partner one day that if a good fat Dutchman and his wife got into one of those rooms at the same time they would break down the whole block." With these facts before the practical reader, it is hardly necessary to attempt to draw a moral. It is evident that rascally builders in this city succeed in hoodwinking the Building Department and evading the system of inspection that is at present in vogue. How many buildings of this same character are in existence which only require a slight disturbance of their foundations to precipitate a like destruction can only be surmised. Popular indignation against the contractor in this case is extreme at the time of writing, and, from evidence that has been brought before the coroner's inquest, it is probable that he will be indicted. This, however, does not remove the risk from those who are living in buildings of the same character, nor will it alone put an end to the kind of building of which this is a characteristic example.

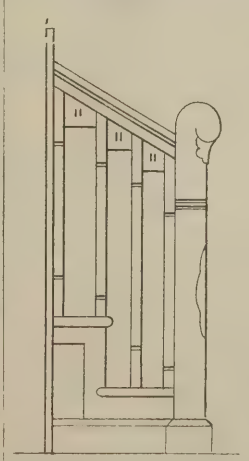


Porch Finish.—Scale, ½ Inch to the Foot.

A somewhat hasty examination of the subject, in view of the fact that a great majority of dwellings, shops and business buildings in this country are of a cheap and somewhat combustible character, would incline one to believe that the greater part of the loss caused by fire is to be found in such buildings. From insurance statistics, however, it appears that the reverse of this is the case. The heaviest losses occur among those costly examples of architecture on which there is often expended twice the money necessary to have made them safe. The complete destruction of these buildings from small causes is generally assured by the provision that is made for giving the fire free way through the interior structure, which frequently has only been screened on the outside with brick, stone or iron. One reason why so many fires occur in nominally fireproof structures is, no doubt, that in such cases vigilance is relaxed, and too much dependence is placed on the supposed non-combustible character of the building itself. On the other hand, many fires are prevented in cheap and poorly-built houses by the very care that is exercised over them.

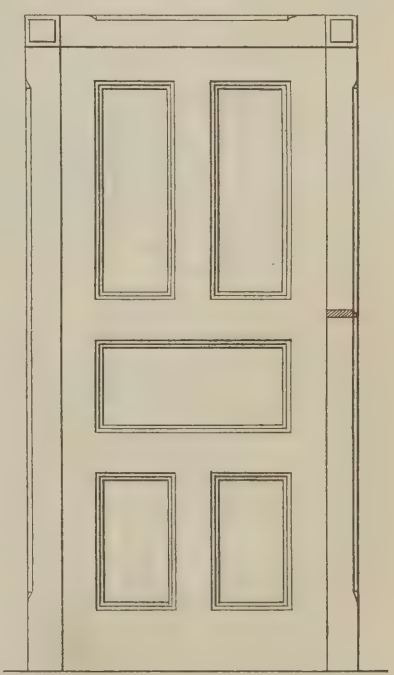
We are indebted to Mr. C. E. Illsley, of St. Louis, for an advance copy of the pamphlet containing the proceedings of the Missouri State Convention of Architects, held at St. Louis, March 27 and 28 last. This meeting was very harmonious and resulted in the organization of a State architect association that commences its existence under most auspicious circumstances. The following officers were elected for the current year : President, Mr. A. Van Brunt, of Kansas City ; vice-president, Mr. C. K. Ramsey, of St. Louis ; secretary, Mr. T. B. Annan, of St. Louis ; treasurer, Mr. J Beattie, of St. Louis. trustees.—Messrs. J. McGrath ; J. H. McNamara, of St. Louis ; A. B. Cross, of Kansas City.

The question of dry-rot is one which concerns many who have the care of buildings, as well as those who are engaged in putting up buildings and who are responsible for features of construction. The cause of dry-rot has been very generally discussed, and its appearance when found is known to the majority of our readers. A Russian professor has been experimenting recently on the best way to remove dry-rot. As the result of his investigation he says that thorough ventilation or draft will destroy the parasite within 24 hours. If the action of the air be assisted by that of sunlight, a few hours will often suffice to put a stop to further damage. A concentrated solution of common salt is very efficacious, and the stronger it is used the more rapid its action. The action of a concentrated solution of cupric sulphate (blue stone, blue vitrol) is still more energetic and complete than that of common salt. Crude carbolic acid is rapid in its action and cheap, but inconvenient to use. But he considers that the best, cheapest and most convenient material to employ is the tar obtained when birch wood is distilled for acetic acid ; the under surface of the flooring should be painted with this tar.



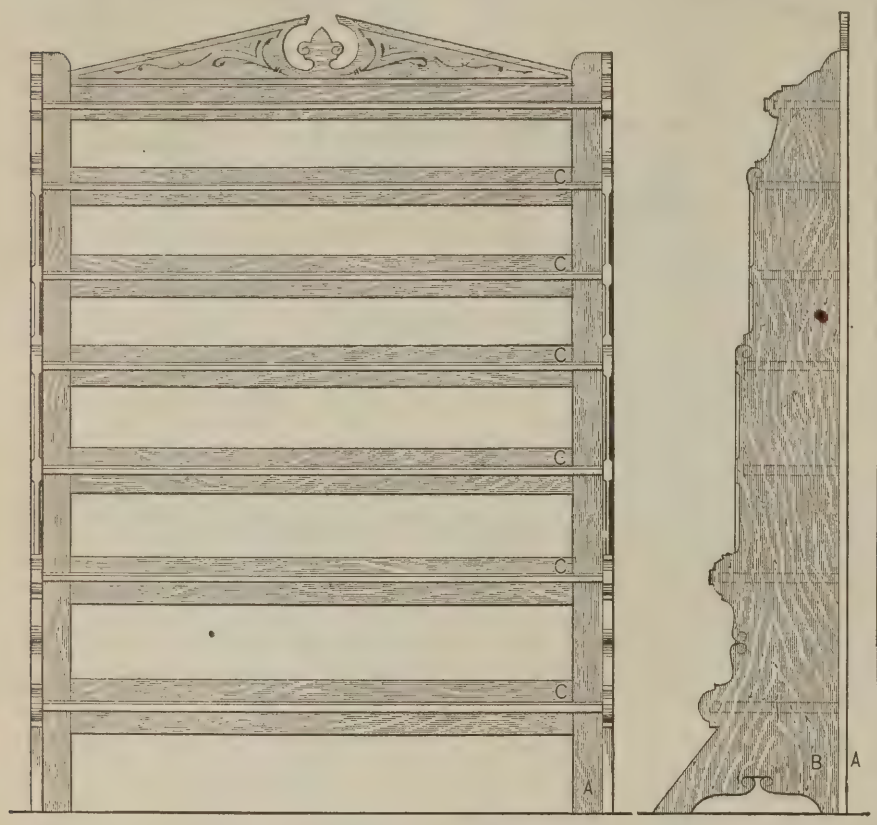
Stairs and Newel.—Scale, ½ Inch to Foot.

The consumption of hardwood in this country for the single item of railroad ties, when indicated in figures, is something surprising. Various articles on the destruction of our forests have presented statistics showing how many acres of land it would be necessary to devote perpetually to timber growth in order to keep up the supply for this one purpose, even with railways no further developed than at present. Various materials have been experimented with in the hope of finding a substitute for timber ties. Glass, iron and other materials have been tested, but without satisfactory results. The fact that some foreign woods, of which it may be supposed large quantities are in existence, have greater durability than the woods grown in this country which are very commonly employed for railroad ties, may have the good effect of saving our own forests and producing an importation of material. It is asserted on eminent engineering authority that the best wood yet discovered for railway sleepers is zapote, used for this



Door and Inside Trimming.—Scale ½ Inch to the Foot.

purpose in Mexico. It is essentially a tropical timber, and is exceedingly durable for outdoor or indoor work, above or below ground. Samples of this wood taken out of buildings said to have been erected more than two centuries ago did not show the slightest indications of decay, the wood being as sound as on the day it was put into the building. In color this wood is nearly as dark as logwood, is very heavy and sinks in water, and



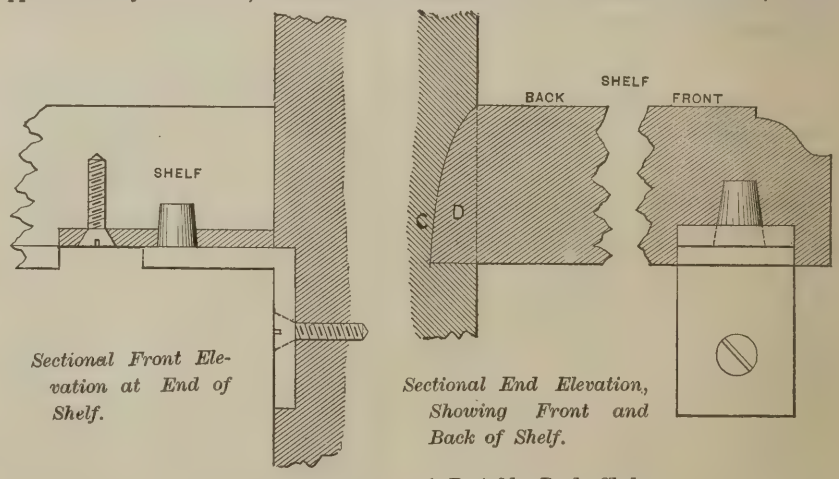
Design for Portable or "Knock-Down" Book Shelves.—Scale, ¾ Inch to the Foot.

so hard that the boring of the holes for the spikes and forming the grooves for the rails is very laborious work. It appears to be almost impervious to decay, but has a tendency to split if exposed to the heat of a tropical sun for a few months, for which reason the zapote sleepers have to be kept equally covered with ballast.

Portable Bookcase.

Various designs and constructions of portable bookcases have been brought before the public in the past, a number of which, in this country, at least, are patented. There still seems to be a demand for good articles of this kind, however, particularly for such as may be constructed by mechanics of average intelligence and experience, either for their own use or to meet special requirements in the houses of their friends and patrons. Most of the patent constructions with which we are acquainted provide for adjustable shelves by which they can be made to accommodate different sizes of books. While this feature is desirable in certain instances, there are many cases in which it is useless, and very generally the expense and trouble of providing the adjustability is far in excess of the usefulness of that feature. The books of an average library do not differ so much in size but what the shelves may be arranged once for all, with the assurance of their giving fair satisfaction. That they should be graded so as to accommodate books from the largest to the smallest that are ordinarily purchased will be generally admitted. It will also be admitted that the width of a shelf for accommodating small books need not be so great as that for holding large books. Accordingly, this feature may be taken into account advantageously in designing a bookcase.

The portable bookcase which we show herewith has some special points of merit that should recommend it for use in cases of the general kind we have described. The construction is sufficiently indicated by the drawings to require very brief description. The ends are hinged to stiles by 3-inch brass butts. The rails coming immediately back of the shelves are dry mortised into the stiles. From shoulder to shoulder of the rails there is run a groove, in which rests the back edge of the shelf, as indicated by the detail. A screw is put through the tenon at each end for holding the parts together. Iron supports, the shape of which is clearly indicated in the details, are let into the ends of the bookcase and the under side of the shelves. Accordingly, the shelves are supported near the front at each end and all along the back, and, by means of the iron support already described, form ties for holding the ends together. The construcion is such that the bookcase can be taken to pieces in a very few moments, and it packs into a very small compass. It is a firm piece of furniture when well constructed, and withal is cheap in first cost. It may be objected that the back of the case, as here shown, is open in such a way as to be a convenient receptacle for dust. This objection, should it be raised by housekeepers, could be readily overcome by filling the spaces between the rails with strips of green cloth, or something of a similar character, which would also form a desirable backing for the books.



Sectional Front Elevation at End of Shelf.

Sectional End Elevation, Showing Front and Back of Shelf.

Details of Construction of Portable Book Shelves.

Notes of the New Orleans Exhibition.

S. A. Woods Machine Company, New York, occupy a large space in which 10 machines for working wood in various ways are shown in operation.

Tunis Gang Flooring Machine Company, Baltimore, show a machine in operation. It receives the rough board and passes it out in three or four pieces of tongued and grooved flooring at one rapid and continuous operation.

Greenlee Bros. & Co., Chicago, show a tenoning machine which attracts much attention from wondering rustics by "boring square holes." This machine works very prettily.

J. A. Fay & Co., Cincinnati, make an extensive display of wood-working machines of standard patterns, many of which have been sold for export as they stand.

Goodell & Waters, Philadelphia, show the Keystone flooring machine, which is adjustable to a variety of uses, including the cutting of a great many shapes of fancy moldings.

Geo. V. Cresson, Philadelphia, makes a good exhibit of shafting and pulleys.

H. B. Smith Mfg. Co., Smithville, N. J., occupy a large space which is filled with wood-working machines and "Star" bicycles.

E. & F. Gleason, Philadelphia, wood-tool works, exhibit band saws and machine lathes.

John A. White, Concord, N. H., shows hoop-making and saw-sharpening machinery, band saws, planers, buzz saws, &c.

Buss Machinery Works, Grand Rapids, Mich., show planers and band saws.

M. Scovel, Chicago, exhibits a saw sharpener, swage and bench.

J. A. Perry & Co., Berlin, Wis., show wood-polishing machines.

Forsaith Machine Company, Manchester, N. H., make a great display of their machinery for wood-workers' and machinists' use.

E. Gould & Eberhardt, Newark, N. J., exhibit their quick-stroke shaping machines, which have lately been remodeled and rendered more efficient.

L. Schulte & Co., Philadelphia, show their single and double post planers and the "Hercules" engine.

Chattanooga Saw Works make a fine display of large and small circular saws with solid and inserted teeth.

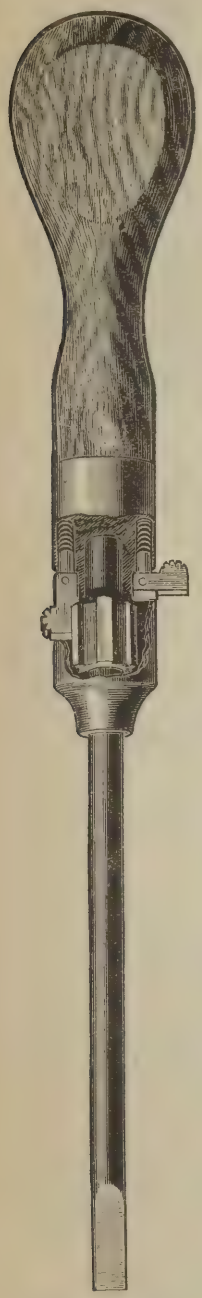
Henry A. Holt, Wilton, N. H., exhibits his "Universal" wood-worker, which combines the functions of a double saw bench, molding machine, buzz planer, boring machine and lathe, changing from one to the other by the movement of two arbors.

Fifty dwelling-houses form part of the freight of a vessel bound to Aspinwall, South America, from Portland, Me. The houses are what is termed "knock-downs;" every part, including roof, is finished, and shingles are painted, and they are ready to be set up in about an hour's time after arrival. They were made in the Ottawa district, Canada, and are intended for the men who are at work on the canal. By sending in this form about 33 per cent. in freight is saved.

NOVELTIES.

The Ellrich Ratchet Screw-Driver.

The accompanying illustration represents the Ratchet Screw-Driver, which is put on the market by the Ellrich Hardware Mfg. Co., Plantsville, Conn., for whom the Alford & Berkele Company are agents, 77 Chambers street, New York. The pawls, of which it will be seen that there are two, are positive and direct-acting, and are placed, as indicated in the cut, in the head of the ferrule, where they are easily and quickly manipulated. When they are both closed the blade of the screw-driver is securely held, and can be used as an ordinary screw-driver without the use of the ratchet. By opening one of them as shown in the cut, the blade is free to revolve in one direction, and the tool becomes a ratchet screw-driver, and when it is desired to reverse the action the other pawl is used. It will be seen that this screw-driver is very simple in its operation, and it is put on the market by the manufacturers with confidence that it will meet the demand of the trade for a well-made, simple and strong ratchet screw-driver. It is made with rose-wood handles of the following sizes: Blades 4 inches long, $\frac{3}{16}$-inch diameter; blades 6 inches long, $\frac{5}{16}$-inch diameter; blades 8, 10 and 12 inches long, $\frac{3}{8}$-inch diameter. The manufacturers also apply their ratchet attachment to a handle which they pack in a neat box with four interchangeable blades of different sizes which can be used if desired in a bit brace. This is referred to as a handsome combination, the handles being of rose-wood and the blades of Jessup steel, forged under the hammer and spring-tempered.



Novelties.—Fig. 1.—New Ratchet Screw-Driver.

Rotary Marking Gauge.

The Sandusky Tool Co., Sandusky, Ohio, are putting upon the market a rotary marking gauge, illustrated in Fig. 2, which, in some of its features, is akin to the rotating plane described elsewhere. It is known as Kenney's rotary marking gauge. Instead of a brad on the end of the shaft by which to do the work, there is a fine tooth marker which rotates, thus stepping over instead of following the grain of the timber. This tool may be used in slitting thin stuff. Two qualities are manufactured—one having a bright steel rod and the other a nickel-plated rod.

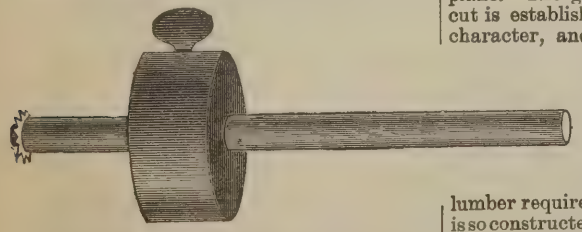


Fig. 2.—Rotary Marking Gauge.

Double Facing Machine.

H. W. Ostrum, of New Haven, Conn., is building a machine designed for straightening and squaring edges, and bringing to width dimension stock, the general appearance of which is afforded by Fig. 3 of the engravings. The cut represents the machine from the rear, a point of view which best shows its working parts. The bed measures 26 x 24 inches. There are two upright spindles with cutter-heads, the left-hand spindle moving back and forth to accommodate different widths of stock up to 6 inches. The stock is held against the straightening gauge by two springs attached to what the maker terms the left-hand gauge. At the rear left hand corner of the bed, as the machine stands in the engraving, there is shown the gauge for setting the cutters. The cutters are 3 inches high, thus giving the machine a capacity for stock 3 inches thick. Edges are squared and brought to a finished width at one operation. The machine is specially recommended by the manufacturer to makers of cigar-boxes and other articles of a similar description. Special attention is directed to the statement that it is a very rapid-working machine.

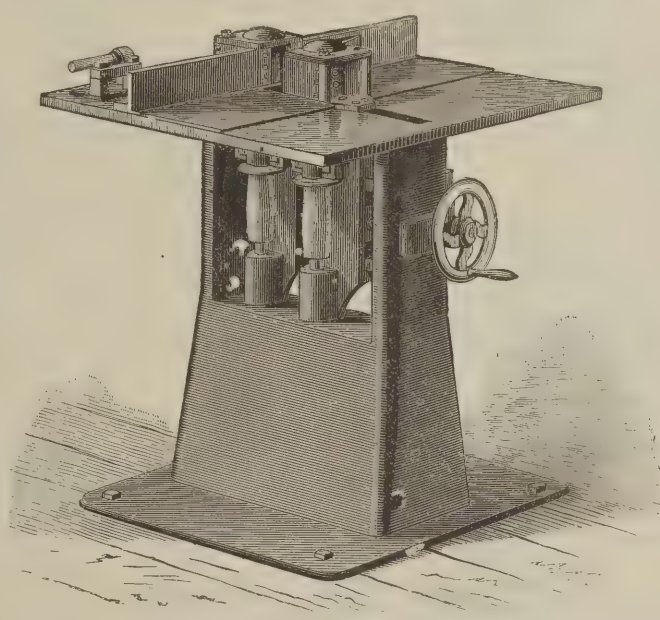


Fig. 3.—Ostrum's Double Facing Machine.

New Gauge Ripping Plane.

The Sandusky Tool Company, of Sandusky, Ohio, are asking attention to Kenney's gauge ripping plane, by the use of which thick or thin lumber can be ripped by hand withease and precision. The engraving, Fig. 4, shows the general appearance of this tool very satisfactorily. By refer ence to the same it will be seen that in its general features it resembles a common plane. The gauge by which the position of cut is established is not unlike a T-square in character, and is held in place by a thumb-screw which impinges against the plate. In the center of the plane a small circular tooth cutter is so arranged as to be raised or lowered by the second thumb-screw on top, as the thickness of the lumber requires. The thumb-screw referred to is so constructed in different sections with right and left hand thread as to readilly accomplish the adjustment above mentioned. When the tool is pushed over the board to be cut the cutter rotates, which prevents its following the grain of the timber. In ripping thick lumber the tool is used on opposite sides of the board. From the engraving it will be seen that the tool is simplicity in itself, and that it can be adjusted to any width with ease. The makers direct attention to the statement that, as this is the only gauge-ripping plane in the market, it fills a want that has heretofore had no supply. Two qualities are made, the stock being of beach and apple wood, respectively.

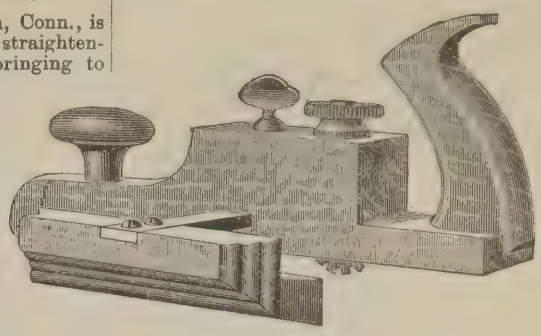


Fig. 4.—Kenney's Gauge Ripping Plane.

Window-Blind Worker.

A. H. Dodd, of Hudson, N. Y., is now introducing a window-blind worker which he calls the "Little Gem," views of which are afforded in Figs. 5 and 6 of the engravings. Fig. 6 shows a horizontal sectional view through a window casing, indicating the position of the sash, and showing the worker in place, with the blind partly closed or bowed. It will be seen that the fixture consists of a shaft of sufficient length to pass through the wall of the house, and that the lower hinge of the blind is arranged in the form of a pinion; a worm on the outer end of the shaft engages with this pinion, and the shaft being revolved by movement of the crank, which projects into the room, the shutter is opened or closed as may be desired. The general appearance of the fixture from the inside is indicated in Fig. 5. By the construction and arrangement of parts embodied in this device no special fastening upon the shutter is required, either for holding it shut or keeping it wide open. At the same time the shutter is equally well fastened at any intermediate point. The advantages to the householder, since it saves

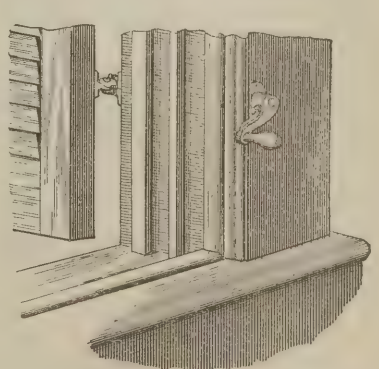
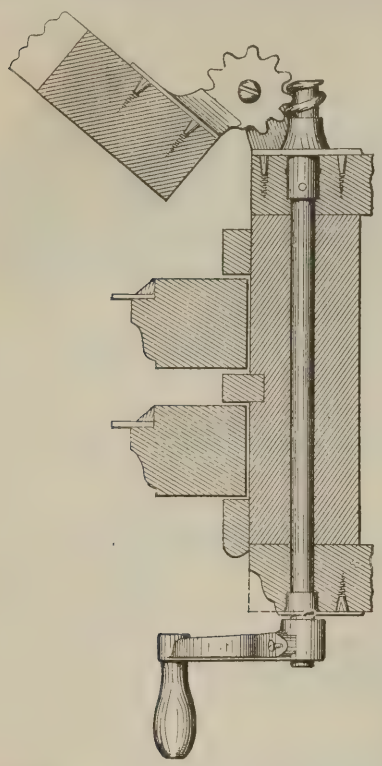


Fig. 5.—The "Little Gem" Window-Blind Worker.

the raising of windows, avoids wet arms and sleeves in stormy weather, and successfully avoids the nuisance of slamming blinds in wind storms, are too apparent to need enumeration. The maker asserts that this fixture will fit any blind, and that it can be used in combination with any upper hinge



Novelties.—Fig. 6.—Horizontal Section Through Window, Showing Construction and Operation of the Blind Worker.

that may be in use. For the purpose of very generally introducing these goods the maker has arranged to send sample sets by mail.

The Patten Tin Shingle.

Messrs. Gummey, Spering, Ingram & Co., of 1023 Market street, Philadelphia, Pa., have just ready for the market a new tin shingle, illustrations of which are presented n the accompanying engravings. It is to be known to the trade as the "Patten" tin shingle, and, it is claimed, combines many excellent features which render it more desirable for use than others which have preceded it. The essential feature of this shingle is that the different pieces forming the roof are firmly attached to each other at all essential points without the use of solder, and that they are fastened to the sheeting boards in such a way as not to be torn up by the wind. At the same time, contraction and expansion are fully provided for. This is accomplished by the double-locking dovetail joint, which is clearly shown in the engravings. On the right of the shingle there are two flanges oppositely inclined to the face of the plate, with a flat valley between them. Nails through perforations in this valley secure the shingles to the sheeting. The left side of the shingle has two corrugations, so situated and of such a size as to pass over the flanges of the plate already attached.

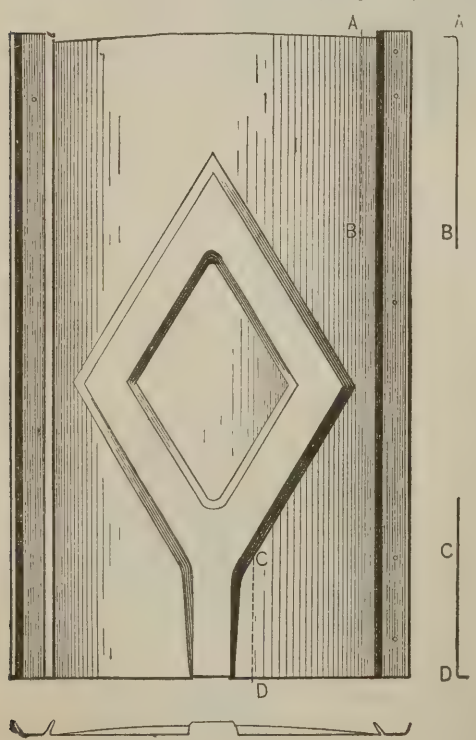


Fig. 7.—General View of the Patten Tin Shingle, with End Elevation and Partial Sections (A B and C D), Showing the Formation of the Hood.

When so placed the corrugations, with their contained flanges, form a joint which locks the second plate to the first already attached to the sheeting. This joint, besides being water-tight, is of such a character as to admit of the contraction and expansion of the metal. The manufacturers claim that by this method the shingles are more firmly attached to the roof-boards and to each other than is possible by any other method in use. At the same time the operation is so simple that the work can be done by any person of ordinary intelligence. The valley of the second shingle covers the nails driven through the valley of the first. Accordingly, the rusting of nails is prevented, and consequently leakage from that cause rendered improbable. The nature of the joint between the shingles is such that should it be desirable to remove the roof covering at any time these corrugations and flanges can be readily disconnected and the joint unlocked. Another prominent feature of this shingle is the hood which covers the joint of the plates below, and the securer or cleat which, passing over the hood, draws it down upon the joint, and firmly secures the upper tier of shingles to those beneath at the middle portion of their lower edges. This fastening of the hood also holds the triangular flanges on the lower edge of each shingle against the surface of the plates below, thus forming a square transverse joint between the two tiers. These triangular flanges, in connection with the corresponding up-turned flanges at the top of the lower plate, form an open space extending from the side joint to the hood, which prevents the upward passage of water by capillary attraction. The body of the securer, which fills the joined valley,

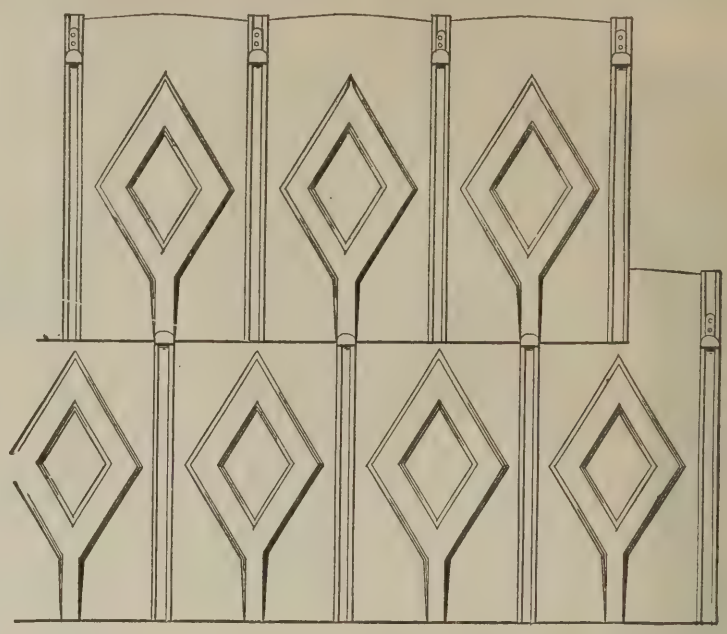


Fig. 8.—Manner of Placing the Patten Shingles on a Roof.

prevents the upward driving of water through the joint. These several features will be better understood by reference to the engravings. The cleats or securers are each

Fig. 9.—Three Views of Cleat or Securer, the Use of Which is Shown in the Preceding cut.

provided with two nail holes, thus giving the workman an opportunity of avoiding cracks or seams in the sheeting boards.

New Door-Knob.

Figs. 10 and 11 of the engravings illustrate the construction and general appearance of the new wooden door-knob just put upon the market by the Yale & Towne Mfg. Co., of

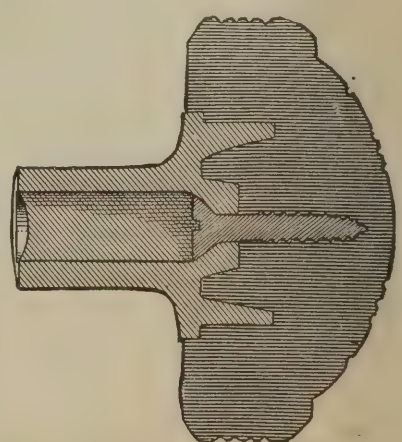
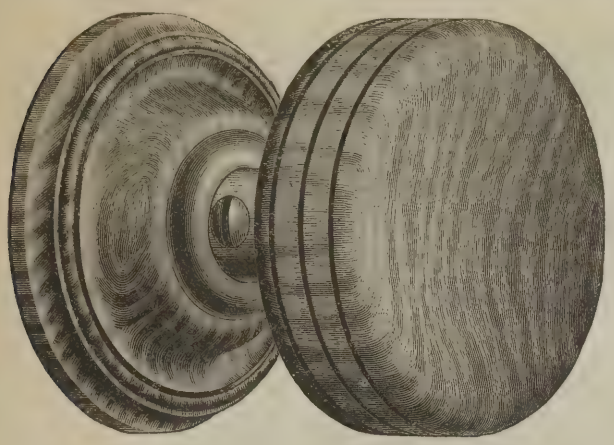


Fig. 10.—Improvement in the Construction of Wood Door-Knobs.

New York City and Stamford, Conn. Fig. 10, which represents a section longitudinally through the knob and the shank, shows the construction. It will be seen that the wooden end is held in place by a screw inserted through the hollow shank in combination with prongs on the shank itself. This con-

struction avoids the unseemly appearance of a screw from the outside, and secures a maximum amount of strength. The new goods are handsome in appearance and seem destined to become very popular with the trade.



Novelties.—Fig. 11.—Appearance of Knob with New Construction.

"Standard" Door-Hanger.

Messrs. Bullard & Gormley, No. 106 Lake street, Chicago, are directing attention to the new movement embodied in the "Standard" door-hanger, a view of which is afforded in Fig. 12 of the engravings. In this device the old Hatfield anti-friction construction is reproduced in a new and improved form, and, as the manufacturers claim, in a way to overcome the objections to the horizontal bar or slot construction commonly embodied in hangers. The shifting back and forth of the wheels on the rebound of the door, as hangers are commonly made, leaves them at the wrong end of the hanger, in which position the principal merit, namely, anti-friction, is destroyed. On the other hand, in the device here illustrated the construction is such that the wheels remain in the same relative position to the door at all times. This is accomplished by the substitution of what is called the "ring" in the place of the horizontal bar. These rings are drop-forged and are of steel. A run of 6 inches is provided. The frames and plates used with this hanger are of malleable iron, making the hangers strong enough for the largest door. The special advantage to which the makers direct attention is that these hangers can be applied and adjusted with less labor than other hangers. Either flanged or flat wheels are provided, as preferred. The illustration shows the flange wheel form. The flat wheel hanger is the same with the exception that it is provided with two anti-friction rollers, one on each of the frames, bearing directly against the rails to prevent side friction of the frame. These hangers are provided with a round bearing upon the axle, thus adapting the hanger to any ordinary irregularity in the rails, such as would be produced by the settling of a building or that might occur from carelessness in putting up the rails.

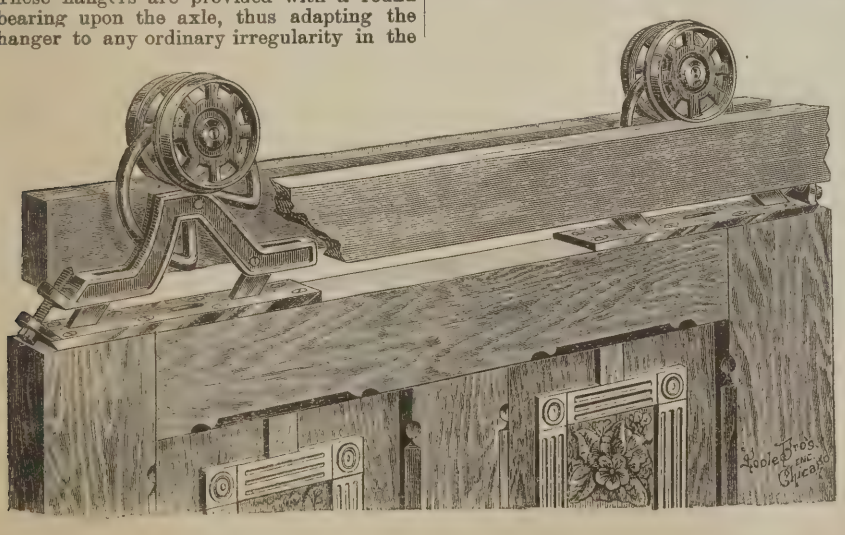


Fig. 12.—The "Standard" Door-Hanger, Brought Out by Bullard & Gormley, Chicago.

The "Universal" Miter-Box.

Fig. 13 of our engraving illustrates what is known as the Spilker "Universal" miter-box, now being introduced to the attention of the trade by J. J. Spilker, No. 48 Central avenue, Cincinnati, Ohio. This box, which is new in design and construction, differs in several important particulars from others that have preceded it. Among the advantages to which the maker directs attention are the following: The longer stroke of the saw is obtained, thus severing the molding more rapidly than is common with other boxes. The gauges may be set to a greater variety of angles. In explanation of the latter, he directs attention to the parts shown in Fig. 14 of the engravings. M, a shell pattern, is cut by tilting the saw guide J to the right or left by means of the slot P, securing it by the thumb-screw shown in the engraving. A cornice molding, as indicated by L, for example, 7 inches wide, is cut by laying flat on the bed-plate from 0, at right angles, to 45°, according to requirements, and is adjustable to various angles while in that position. The back-rest C is movable, which serves to cut sharp angles up to 75°, for example, as illustrated by N, in Fig. 14. F is a toothed clamp to hold the molding while sawing. The angle is shifted with D and secured by the spring stop E in slots O. The saw guide travels between the slots and uprights and is held rigid by the clamps J J, which have three set-screws at the top and two steel-spring collars at the base. These serve to take up the wear. The collar H is for regulating the depth of cut and also for preventing the saw touching the iron bed-plate. The maker further directs attention to the statements that this is the only miter box that can be taken apart and put together in a few minutes. It will pack in a box 3 x 7 x 26 inches, and its complete weight is 25 pounds.

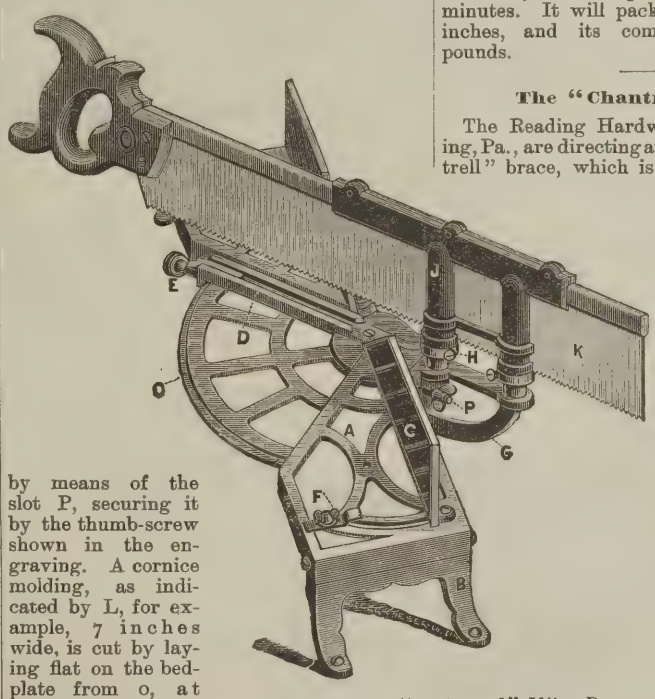


Fig. 13.—The "Universal" Miter-Box.

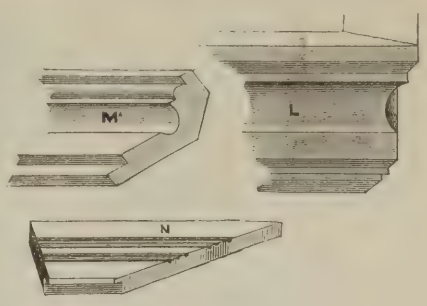


Fig. 14.—Examples of Moldings Cut in the "Universal" Miter-Box.

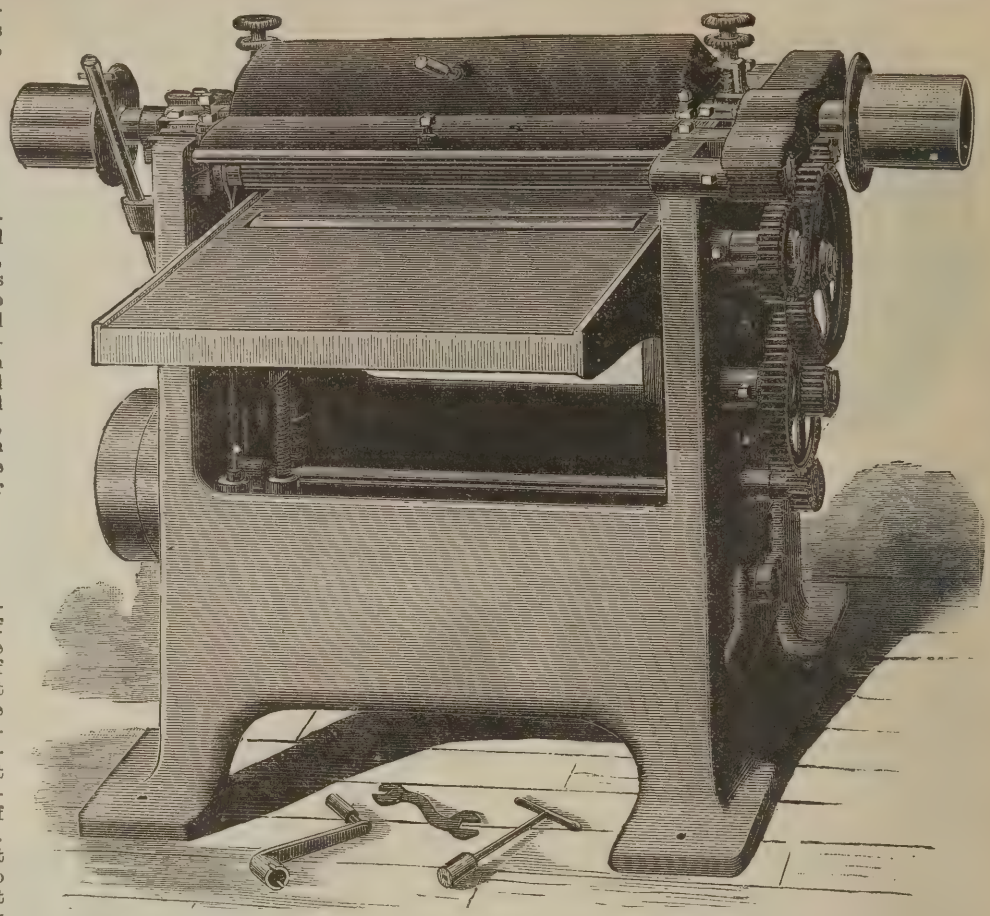
The "Chantrell" Brace.

The Reading Hardware Company, Reading, Pa., are directing attention to the "Chantrell" brace, which is made in two forms, with and without ratchet. They claim for it that several essential requirements have been happily combined in its design and construction. It is declared that the bit or drill is held absolutely fast under all circumstances, and that it will hold a twist drill as rigidly as a specially constructed drill chuck. The tool is grasped at both top and bottom, so that it is impossible for it to twist or move in any direction. The construction is such that there is no friction, and consequently there is no wear on the parts. The fewest possible parts are employed, and each part is of the best material. The ratchet consists of direct-acting dogs placed at the end of the chuck. No metal is cut away, but the full strength of the parts is preserved. The ratchet can be shifted with either thumb or finger, and without removing the hand from the revolving handle. The design is handsome. The parts have a rounded outline and are nicely finished. The revolving handle is of rosewood, and the head of lignumvitæ. The metal parts are nickel-plated.

Planer and Smoother.

The Egan Company, 221–241 West Front street, Cincinnati, Ohio, have ready for the market a new smoothing planer, illustrated in Fig. 15 of the engravings. The company have endeavored to produce in this machine a planer adapted to perfect smoothing, and at the same time having great capacity. The machine planes to a width of 26 inches, and will take stuff 6 inches thick. The arrangement of the presser-bars is such, in connection with the feed rolls, that no chipping or clipping or imperfect planing can occur either in the center of the stuff or near the ends. The makers direct attention to the statement that the machine is substantially built of the best materials. They claim that it is the finest machine of its class yet introduced. The bed is cast plain, is well braced and raises or lowers

in dovetailed slides by an upright shaft convenient to the operator. Any wear can be instantly taken up from the outside of the frame. The head is of steel and is belted at both ends, being provided with two 5-inch-face pulleys to receive the belt. A chip breaker is on each side of the knife. The one in front can be set as firmly on the board as desired. The one at the back is an extension coming down from the bonnet. It swings from a center, and, combined with the other makes a very perfect contrivance for holding the board as it is fed to the cutter-head, and is one of the features which enables this machine to do perfect planing. The feed is described as being very powerful, and the four rolls with which the machine is supplied are large and will feed the board against almost any kind of cut, either in hard or soft wood. Both the upper feeding rolls are covered, so that no shavings or chips can get in.



Novelties.—Fig. 15.—New Planer and Smoother Brought Out by the Egan Co., Cincinnati, O.

New Gravity Lock.

Fig. 16 of the engravings represents the internal arrangement of a simple gravity lock which the Union Door Knob Company of Detroit, Mich., are at present putting upon the market. The special claims to which the company direct attention are as follows: No springs to break or get out of order, simplicity of construction, and impossibility of latch striking dead on the jamb. A very slight turn of the knob is sufficient to throw back the bolt. A very thin case is employed, which requires the least possible amount of mortising of the door. The construction of this lock is so clearly shown by the engraving that further description is unnecessary. The tumblers which the key moves are also operated by gravity.

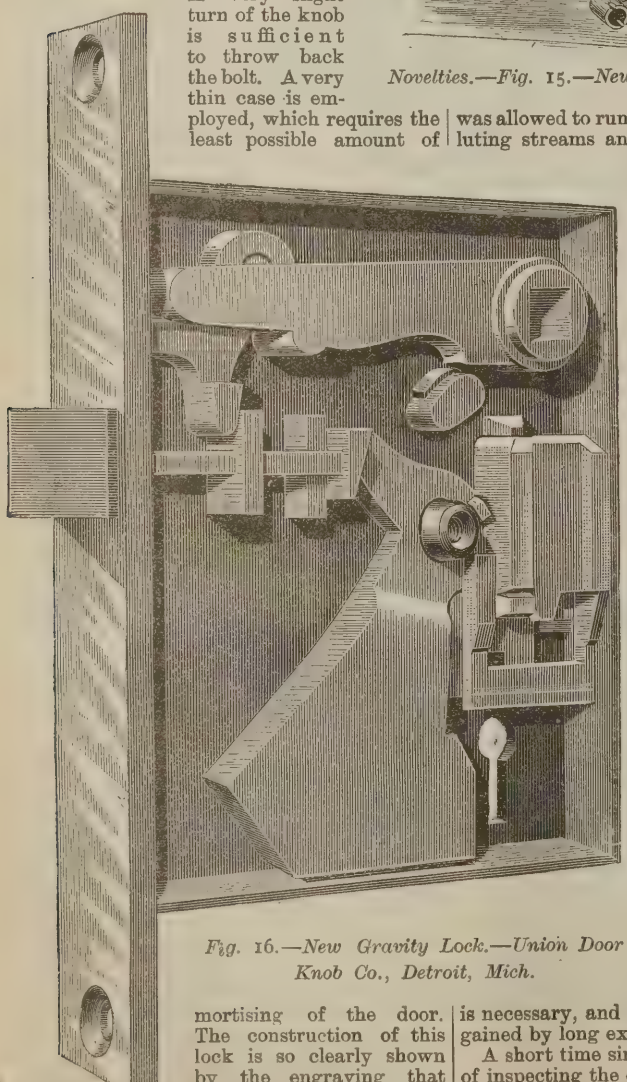


Fig. 16.—New Gravity Lock.—Union Door Knob Co., Detroit, Mich.

Composition Roofs.

Only a little while ago the coal tar of gas works was considered a waste product and was allowed to run away from the works, polluting streams and creating a nuisance generally. A little later coal tar was reduced by boiling in open kettles until the consistency of pitch was reached, in which condition it was employed for roofing. Still later the evaporation was transferred to specially constructed stills, and the volatile portions, which heretofore had been allowed to escape into the atmosphere, were found to be valuable products adapted to use in various directions. Among other applications may be mentioned the manufacture of aniline colors. The present treatment of gas coal-tar is on the basis last described. In coal-tar pitch used for roofing purposes there is the choice between a good article and that which is scarcely fit for use. Coal tar as it runs from the gas works is too thin to answer for roofing purposes, and must be reduced by distillation, as above described. At the same time it can be solidified to such an extent or distilled to such a degree as to become hard and brittle. An intermediate point, therefore, is necessary, and just what this is has been gained by long experience.

A short time since we had the opportunity of inspecting the extensive works of Messrs. M. Ehret, Jr., & Co., Philadelphia, and many of the facts with reference to coal tar and its use in composition roofs presented herewith were gleaned at that time. This firm carefully discriminate in the character of the pitch they ship with reference to the climate in which it is to be used. A pitch sufficiently soft to answer a good purpose in the northern portions of the country would be likely to run on the roof if used in the South; and, on the other hand, a pitch made hard enough to answer in the South, considering the extreme heat of the sun to which it would be subjected, would be so hard as to be brittle in the North, especially in the winter. The difference between the different grades thus indicated is simply the extent of the reduction or amount of distillation.

The preparation of the pitch is only a single step in the manufacture of composition roofing material. Another is the preparation of the base—or, in other words, the paper or felt—to which the pitch is to be applied. Various qualities of this may be obtained in the market, and various results may be secured, both in the matter of saturation preparatory to its use and also in the laying of the roof itself. A felt made of shoddy is spongy, and will take up several times its weight of tar, and therefore it is not so advantageous for use as one which is made of better material, more firmly knit together, and which will not take up more tar than its strength will carry. Differences arise also from the fact that some felts are made entirely from woolen materials, from which the word felt is derived, while others are made from this material more or less adulterated with straw. In the process of saturating felt coal tar is used before it has been reduced to the consistency of pitch. In this condition it penetrates the paper readily and forms a desirable base for the pitch which is afterward applied. The quality of saturated felt after manufacture may be judged in some measure by the appearance of crystals on its surface. These to a certain degree are indications of its age. Saturated felt improves by a seasoning process, somewhat as lumber improves by seasoning, and this seasoning can no more be hastened by artificial means in the case of felt than it can in the case of lumber. The crystals which are sometimes seen upon the surface of saturated felt are said to be crystals of naphthaline, and age is desirable in order to allow this crystalliza-

tion to take place. A brand of felt known as the "Acme," which the firm above mentioned produce, it is claimed is made from materials carefully selected with reference to these considerations, and before shipment is allowed to season, so as to possess the special merits above enumerated.

Felt is variously laid in the process of roofing in from three to six thicknesses, known in the trade as three-ply, four-ply, six-ply roofing, &c. These layers are combined in such a way as to make one overlap the other, not unlike the process of shingling where wooden shingles are used. The felt is fastened to the roof by nailing through tin washers. As the several layers overlap those below, a quantity of hot pitch is mopped between the sheets, so as to firmly cement them together, after which pitch is copiously applied to the surface of the roof. Finally a layer of coarse sand or gravel is applied hot. The office of the gravel is to protect the pitch in some measure in summer, and to overcome the extreme effect of cold in winter. It is to a certain extent a non-conductor, and, besides, contributes to the roof a white or grayish color, which, with respect to its heat-conducting properties, is superior to the black that would otherwise occur. The object of heating the gravel is to more thoroughly imbed it in the pitch, and thus cause it to hold its place against wind storms. Improvements on the use of gravel have been suggested. The Warren Ehret Roofing Company, of Philadelphia, make a specialty of crushed stone or crushed slag as a material for use in the place of gravel. Among the advantages claimed for this are that the pieces are angular, which gives them greater adhesion to the pitch, and that the roof is more thoroughly covered. The material is also lighter than common gravel, the difference being about 200 pounds per square in favor of the former.

In addition to the preparation of roofing pitch and saturated felt for the use of composition roofers, as above described, Messrs. M. Ehret, Jr., & Co., manufacture a "ready-made" roofing, known as "Black Diamond," to which attention has already been directed in these columns. It partakes of the nature above described, but is so prepared in the factory as to lessen the outside labor and save the necessity of heating kettles for applying the pitch. It consists of two or more layers of saturated felt, united by layers of pitch or cement. The latter is applied hot by special machinery, and the resulting roofing is put up in rolls, ready to apply by any one who may be in need of such material. The roofing is nailed in place in the ordinary manner, and is then coated with a specially-prepared roofing cement which does not require heating. This roofing has the advantage of being cheap, easily applied and fairly durable. The makers do not claim it equal to a slag or gravel roof, but assert that for the purpose for which it is intended it is very desirable.

Referring to composition roofs of the ordinary character, attention should be directed to the quality of the foundation that is prepared for the roofing. Unless tight sheeting boards are furnished, thoroughly fastened upon a framework strong enough to hold the weight of the roofing without sagging, it is impossible to lay a composition roof—or any other roof, for that matter—in a way to be entirely satisfactory. The better the foundation, all things being equal, the better the resulting roof. The influence of angle or fall is also to be considered. The composition roofer likes a fall just sufficient to throw the water from the roof, and prefers to avoid those roofs which are very steep, and which would cause his gravel and pitch to work to the gutter under the influence of the hot sun. Inasmuch as the most destructive influence that can interfere with the composition roof is the heat of the sun, roofers who make a specialty of this character of work do not object to covering roofs that are absolutely flat.

The well-known fact that the resistance of large timbers to strains is relatively less than small pieces has given rise to no small discussion upon the proper dimensions for test pieces. In this connection *Engineering* cites the case of a storehouse which was recently examined and whose floors were constructed of 4-inch spruce plank supported by Southern pine timbers 16 x 9½ inches, 26-foot span, and 8 feet between their centers. The floor was loaded uniformly with bales of goods weighing 125 pounds per square foot of floor. This, with the weight of the floor, made the total uniform load 141 pounds per square foot. The mean deflection of the beams was 3 inches, and the modulus of elasticity corresponding to this flexure amounts to:

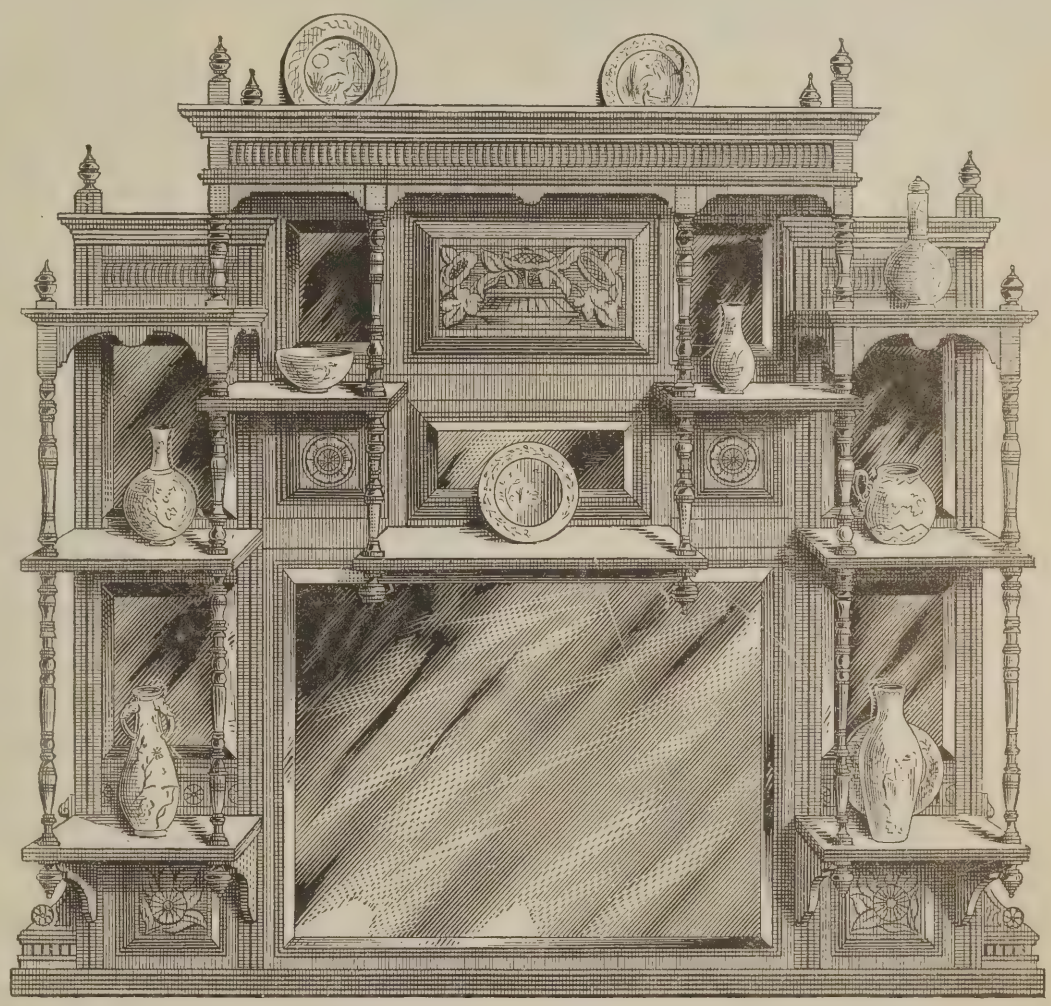
$$E = \frac{270\, s\, l^4\, w}{b\, h^3\, d} = \frac{270 \times 8 \times 26^4 \times 141}{9\tfrac{1}{2} \times 16^3 \times 3} = 1{,}193{,}233 \text{ lb.},$$

about three-quarters of that obtained in experiments upon small selected members.

The tower of the new City Building, Philadelphia, will, with the exception of the Washington Monument, be the highest structure in the world; but, though the pressure on the foundation is nowhere more than 9 tons to the square foot, the settlement of the more heavily-laden portion has cracked and broken the polished and sculptured stone in the interior.

Over-Mantels.

Among decorators, and to a certain extent in the cabinet trades, over-mantels are coming to be recognized as staple articles, like mantels and other house fittings. Their purpose would seem to be to supply a need in the original design or furnishing of a house, and yet there are designs of chimney pieces in which the mantel and over-mantel are two separate pieces, although forming one harmonious design when in place. The term over-mantel is a convenience in designating that finish or that arrangement of mirrors and shelves which frequently occurs above the shelf in the finish of a chimney piece. In England perhaps more than in this country has attention been given to separate designs of this sort. Our exchanges frequently contain illustrations of them, and cabinet-making catalogues from the other side not only give designs, but contain extended price lists, showing that a considerable demand exists for these goods. We present a characteristic design herewith, published by Messrs. A. Goslett & Co., of London. A mirror forms the lower central panel, and is a conspicuous feature of the design. Slender columns resting on the lower shelves, which are supported by brackets, carry the upper shelves, thus forming convenient and appropriate receptacles for bric-à-brac. Some of the upper panels are embellished with glass, and others by carving or leather-work. There is an occasional demand for articles of this kind in this country that our readers are sometimes called upon to supply. Accordingly, such a design as is here presented, showing how the lower part is arranged to fit over a mantel of almost any character, the principal fastening being through the body into the wall or chimney, cannot fail to be of interest. The design presented is simple in its parts, and with the assistance of a lathe with which to turn the spindles, and with tile or carved panels for decorations, is not beyond the ability of any good joiner to execute.

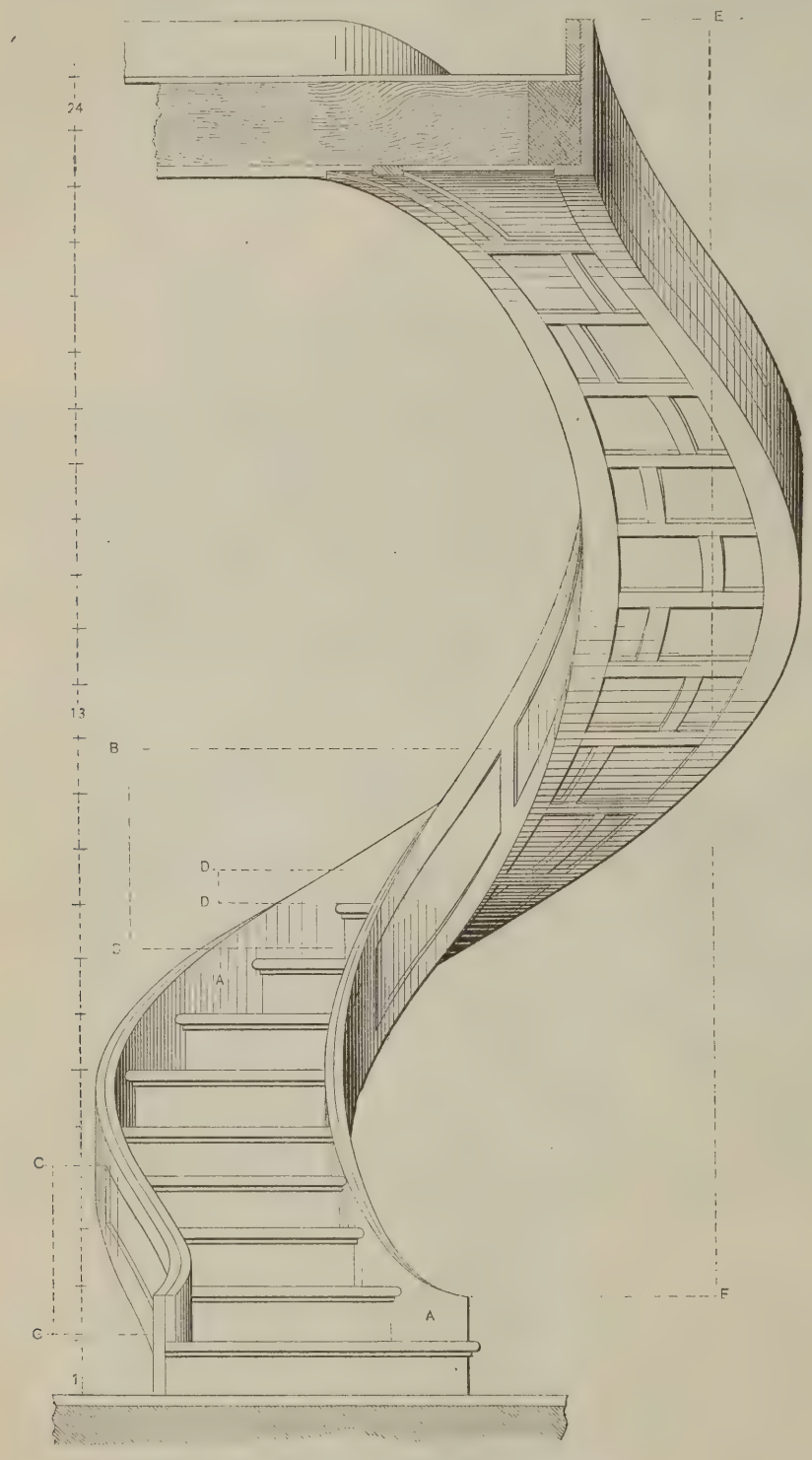


OVER-MANTEL DESIGNED BY A. GOSLETT & CO., LONDON, ENGLAND.

Self-Supporting Stairs.

A correspondent in Hamilton, Canada, referring to the article on self-supporting or circular stairs which appeared in our November number, raises some questions which indicate that the subject can be further treated to advantage. We quote from his letter: "I would like to ask you something about the construction of the drum or drums, for it seems to me two would be necessary in the style of stair represented. I would like to know, for instance, the length the drum would require to be; and I would be glad to see some general remarks as to the way in which it is built. I would like also to ask one or two questions with reference to Fig. 8 in the article named. I want to know how the hight is ascertained without first making an elevation; also I would be glad if the manner of getting the face mold of the rail could be made plainer. My idea of such a stairs is that neither of the strings would be mortise strings, and yet, by reading the article, it would appear that they are spoken of as mortise strings."

The article on self-supporting stairs, which appeared in our issue for November, 1884, was prepared according to questions asked regarding stairs of the kind named, as well as some of the modes of building the different kinds of strings. Accordingly, if it has appeared to the reader as not fully meeting his ideas as regards stairs of the kind named, due allowance must be made. On page 216, in the second column, it reads: "Then slip the back string on securing the ends of the risers either by screws or nails." The back string has reference to the outside or larger circle; the risers to the pieces used in framing the carriage, the ends entering each string ¾ inch. The stairs described were intended to be open stairs with returned nosings, as Fig. 5 of the engravings published at the time would indicate, but, as it is not usual to panel strings of this kind, it is to be supposed that the string will run above the treads, in order to give the proper width for paneling, as the question asked was, "How to get out the moldings for the panels, if it is necessary to have panels?" The scribe string referred to as on the back, to be put in place after the steps are on, is at the back of the panel string on the stair side. As the outside of each string is the face, so is the inside the back, and the strings A A will scribe down on the finished steps, as illustrated in Figs. 1 and 2. In reference to taking the string from the drum and marking the treads with a knife, this should have read the "rise line," as the riser lines are laid out with a pencil. It was intended to cover the whole ground in a general way as regards the mode of constructing strings generally, whether for self-supporting or ordinary stairs, as the stair-builder may have occasion to execute.



Self-Supporting Stairs.—Fig. 1.—General View of Self-Supporting Stairs Constructed from Plan Shown in First Illustration, Page 92.—Scale, ½ Inch to the Foot.

In reference to Fig. 8, November number, the hight is taken from the panel as it is laid out on the string, shown at B B C C, Fig. 1, present issue, requiring no other elevation, but applying the hight so taken to the portion of the plan over which the panel will be, as shown at A L C, Fig. 8. It is usual to build the larger drum first, and do all the bending on it, after which it can be taken apart and reduced, the ribs answering for the smaller drum. When through bending all the strings, take the staves and use them for furring the stairs, as it is cheaper to build new drums when wanted than to have the old ones taking up valuable room that is wanted for other purposes. Further consideration of this general subject will be of interest to our readers.

The drum is formed by making as many circular ribs (A, Fig. 3, of the accompanying engravings) as are desired for the length of the staves B to be used, placing them—that is, the ribs—about 2 feet 6 inches apart,

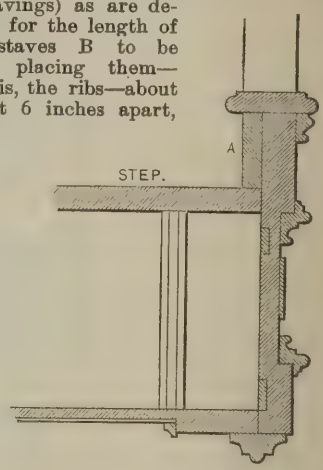


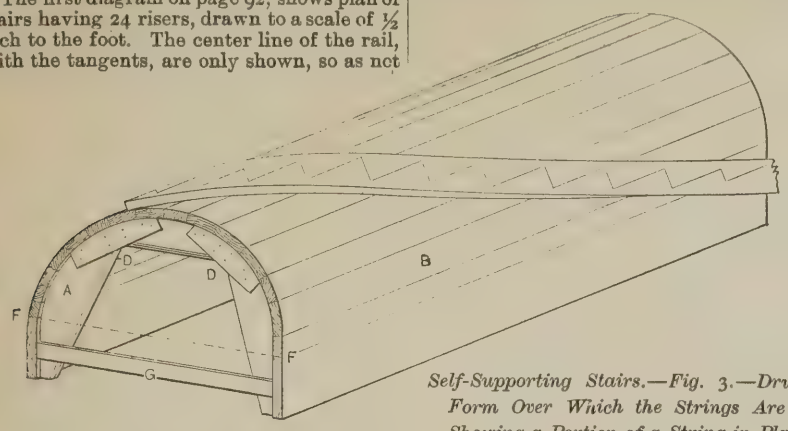
Fig. 2.—Section Showing String, Panel Molding, Soffit and Step, with Baluster in Position.

letting the end ones be about 6 inches from the ends of the staves. The length of the staves will depend on the number of risers in the strings to be bent. If the number be 10 and the hight of the risers 8 inches, then 6 feet 8 inches would be the length, with the plumb width of the string added to this—perhaps about 1 foot 8 inches—making the drum 8 feet 4 inches long; this will bend one string. If desirable to put two strings over at the same time, then there must be added about 2 feet to the length already given. The staves may be of different widths, but jointed so as to fit snugly together and fastened to the ribs with two nails at each rib; after which dress off true, so as to leave no ridges. Brace the ribs by putting a stay, as shown at G. The section composing the ribs will be held in place by pieces fastened over the joint, as at D D. At F F is the chord line below which there may be straight wood if desirable and of any width; this gives a resting point as it is placed upon saw benches when in use.

In considering the mode of constructing the hand-rail for a self-supporting stairs we have shown the stairs as constructed in Fig. 1, drawn to a scale of ½ inch to the foot, having 24 risers. A A represents the inside scribe string, D D shows the hight of string over rise as capped, B B and C C hight of panel in which the molding is to be fitted or a mold drawn to square up the same; E E the hight for the rail. As the balusters

are to be of one length on the flight, and level, the capping on the level is arranged accordingly.

The first diagram on page 92, shows plan of stairs having 24 risers, drawn to a scale of ½ inch to the foot. The center line of the rail, with the tangents, are only shown, so as not to have unnecessary lines to confuse the reader. From Y as a center describe the outside circle from C to U. Draw from Y to G, cutting the curve at C, Fig. 5. Then from G as a center describe the curve C X. Then X will be the center of the newel. Find the center for Fig. 8 in the same manner, from Y to G, cutting the curve at U. Then from G as center describe the curve U W. Let A, Fig. 5, be the point of the miter shown at B, Fig. 22, and found in the following manner. This figure is drawn to a scale 1 inch to the foot: From A as center describe the center line of rail C D. From C as center describe the diameter of the cap. Then set off on the inside of the cap line ¾ inch, and describe the curve E E. From D as the center of rail set off F F, the width of rail, and describe the curves, cutting the cap line at G G. From the inner circle set on ¾ inch, as at H, and describe the curve, cutting the inner line of the cap at I. Connect G G, giving what is called the cheek of the cap. Through the intersections G I draw the miter line to the center of the rail at B; connect B G on the opposite side, completing the miter. A, Fig. 5, is the same as B in Fig. 22. Now, lay down on the plan the tangents in as many equal divisions as is desirable—in this case there are four—as from C to S. From S to U is less in space, as shown. At right angles from G A, Fig. 5, draw the tangent A B. Draw C B in the same manner. Now, from C to S mark off five equal spaces—thus C M, M O, O Q, Q S; the points thus produced are where the joints will occur. At right angles from Y and through the points as indicated at O M, Fig. 6, draw the tangents, forming the angles at N. Produce the point D by drawing O D parallel to M N and M D parallel to N D. Draw the tangents S T and T U, Fig. 7, in the same manner as for Fig. 6, producing D by drawing parallel to the tangents. At right angles from G U, Fig. 8, draw the tangent U V from G W; draw the tangent W V; draw U D parallel to V W; draw W D parallel to V U. For the inner circle let X be the center of the newel and 6 the center from which the curve 3 X is described. Let 1 be the point of the miter. At right angles from 6 1 draw the tangent 1 2. At right angles from 6 3 draw the tangent 3 2; this figure is enlarged to 1-inch scale at Fig. 18, and will be explained in its proper place. Now, from 3 to 11, divide in four equal spaces, as indicated at 3 5 7 9 11; the points thus indicated are where the joints will occur. The tangents will be at right angles from Y 7; draw 7 8; draw 9 8 in the same manner; draw 9 10 parallel to 8 7, and 7 10 parallel to 8 9. Fig. 11 of the plan is the landing easment. At right angles from Y 13, draw the tangent 13 12; extend 10 11, producing 11 12. This figure is enlarged at Fig. 13 to 1-inch scale.



Self-Supporting Stairs.—Fig. 3.—Drum or Form Over Which the Strings Are Bent, Showing a Portion of a String in Place.

Now, having laid down the position of the tangents on the ground plan, the next in order is to draw the elevation of the tangents, in order to draw the mold. The first operation is to draw a horizontal line, A P, Fig. 4, as a base line, indefinitely. Then draw P W parallel to A P. The hight or distance between these lines must be equal to E E, as shown in Fig. 1. Now space off the several divisions on the lower lines as they are on the ground plan, commencing with the outer circle at P, the thirteenth rise—thus, P O N M L C B A—and from the points thus marked erect perpendiculars indefinitely. Then space off the remaining spaces on the upper line P Q R S T U V W, and from these again drop perpendiculars indefinitely. The next operation will be to space off for the inner circle in the same manner, thus, 7 6 5 4 3 2 1, and from these points erect perpendiculars indefinitely. Then in like manner space the remaining divisions, as 7 8 9 10 11 12 13, and drop perpendiculars, as before. Now, upon the perpendicular P P locate the 13th rise, and let the space 7 13 on this line equal D D, Fig. 1, which is the hight of capping over rise. Connect B P and P V, which will be the length and pitch of the tangents for the outer circle. The remaining two divisions A B on the lower line and V W on the upper line are the level tangents. For the inner circle connect 2 7 and 7 12, giving the length and pitch of the tangent; 1 2 and 12 and 13 are the level tangents. Then where the tangents cross the perpendiculars will give the hight and length of each division for the molds. We will next determine the length for the several molds. The first in order will be Fig. 5, starting from the cap of the outer circle. Let D C at E 5 elevation equal A C, Fig. 5, of the plan; connect C D on elevation, giving what is called the major length of mold to draw Fig. 14 from. For the major length of Fig. 6, from M on the elevation E 6 draw a line parallel to

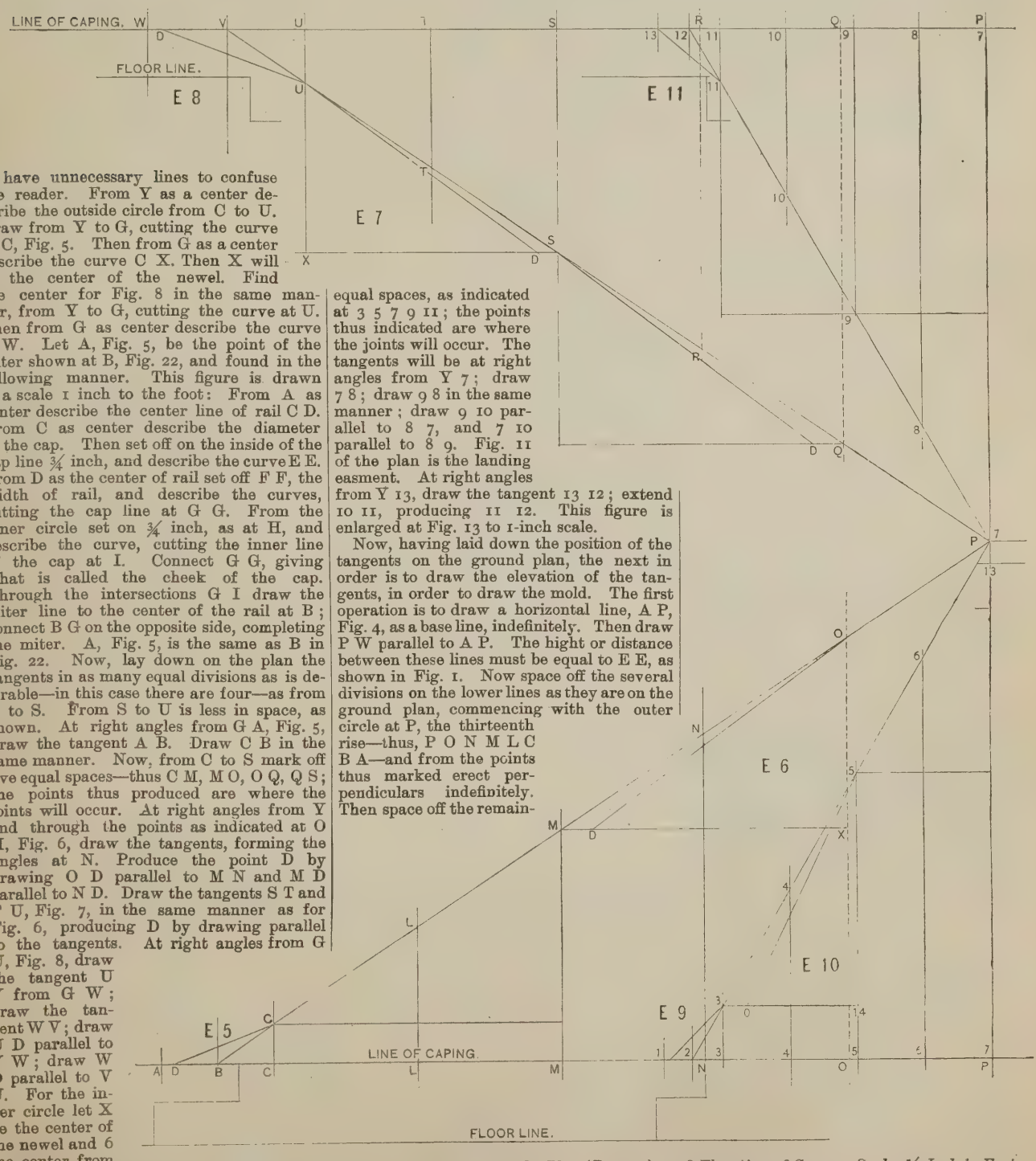
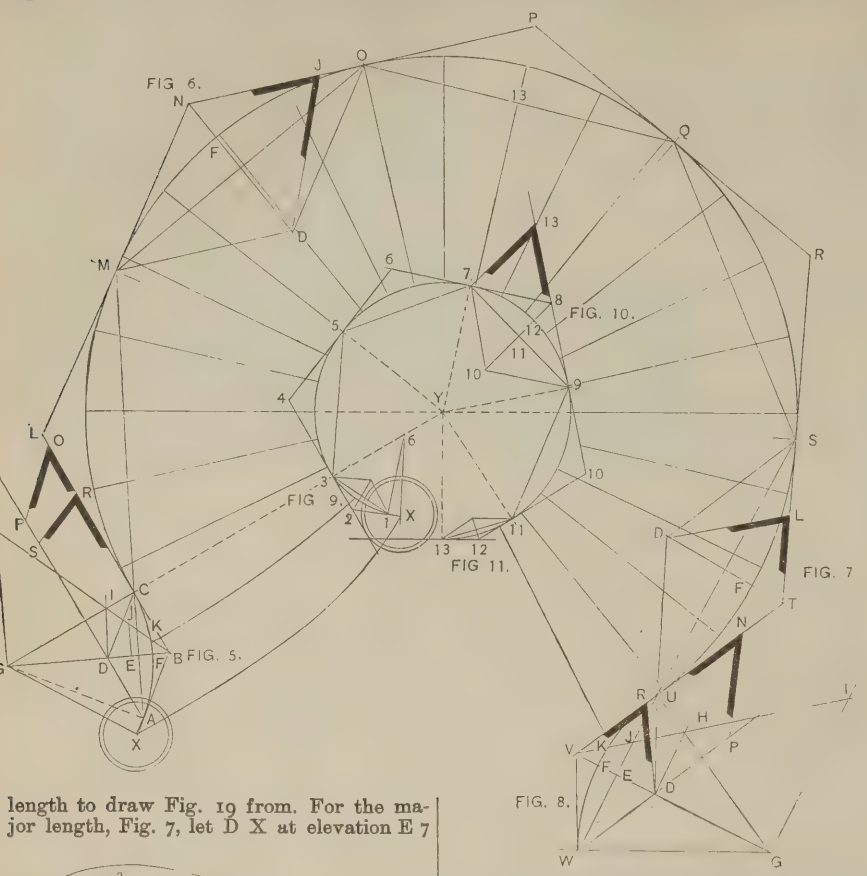


Fig. 4.—Stretchout of the Tangents as Taken from the Plan (Page 92), and Elevation of Same.—Scale, ½ Inch to Foot.

the base line, terminating at X; now from X set off to D equal to M O of the ground plan Fig. 6. Connect D O, giving the major length to draw Fig. 19 from. For the major length, Fig. 7, let D X at elevation E 7



Self-Supporting Stairs.—Figs. 5 to 11.—Plan of Stairs, Shown on Page 90, with the Center Curve Line of Rail, the Divisions of the Rail as Formed by the Tangents and the Different Centers Used in Drawing the Circles.—Scale, ½ Inch to the Foot.

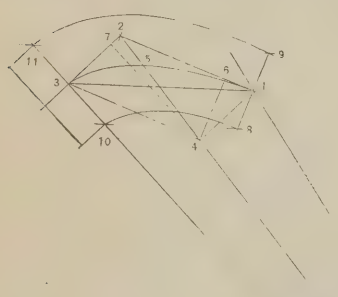


Fig. 12.—Mold for the Landing Easement of the Inner Circle, as Shown at Fig. 11 of the Plan and by E 11 of the Elevation.

equal S U, Fig. 7. Connect D U, giving the length required to draw Fig. 16. For the major length of Fig 8, let V D at elevation E 8 equal U W, Fig. 8. Connect U D, giving major length required to draw Fig. 15 from. For Fig. 10, let O 14, elevation E 10, equal 7 9, Fig. 10; connect O 5, giving major length to draw Fig. 20 from. Fig. 9 will be enlarged at Fig. 18 to a scale of 1 inch to the foot, or twice that of Fig. 9; this is for the purpose of showing more distinctly the operation of producing the major and minor lengths. From J as a center describe the curve A C. Connect J C extended indefinitely. Connect J A; draw the tangents at right angles from C J and A J, producing the angle at B; extend C B indefinitely. From C as a center describe A I. From C to H is the hight found on elevation E 9, double that of 3 3. Connect H B, giving the pitch and length of tangent. Connect H I, giving the major length to draw Fig. 17 from. Produce the point D, as before, by drawing parallel to tangent, completing the parallelogram. From D erect a perpendicular at right angles from J D. Set up the hight from D G equal to C H. From J erect a perpendicular indefinitely. Connect B G extended, cutting the perpendicular from J at K. The length B G is what is termed the minor length. From the center line of rail at E erect a perpendicular, E F. Now proceed to draw the mold, Fig. 17. Thus let 1 3 equal I H, with the compasses in 1, and describe the arc 2; then place the compasses in 3 and describe the arc 4. Then take the length A B and describe the arc cutting at 2; then from 1 to 4 in the same manner connect the points, completing the parallelogram; connect 2 4 and extend indefinitely; at right angles to the tangents 2 3 draw the joint and extend, cutting the line 2 4 at 12.

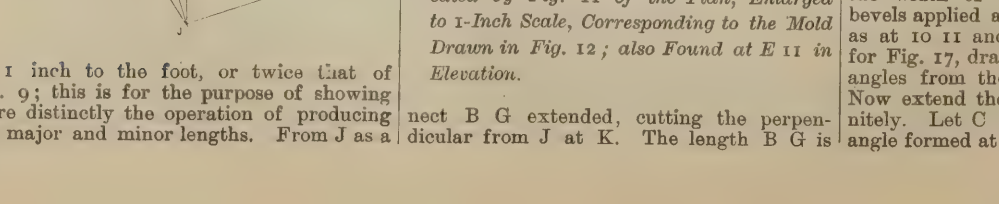


Fig. 13.—Ground Plan of that Portion Indicated by Fig. 11 of the Plan, Enlarged to 1-Inch Scale, Corresponding to the Mold Drawn in Fig. 12; also Found at E 11 in Elevation.

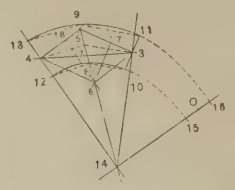


Fig. 14.—Mold for the Starting Easement at the Newel of the Outer Circle, Fig. 5 in Plan and E 5 in Elevation.

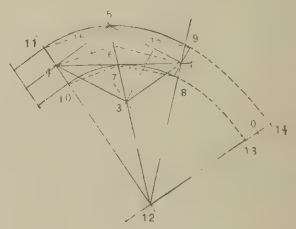


Fig. 15.—Mold for the Landing Easement, as Shown by Fig. 8 in the Plan and by E 8 in the Elevation.

From 12 draw 13 14 at right angles to 3 12. Then 3 12 is the major axis and 13 14 is the minor axis from which the curves may be drawn. Let 2 5 on the minor lengths equal B F; this gives the center point in the mold. Draw the joint through 1. For the width of mold at the joint 1 make it ¾ inch wider than the rail, as 8 9. From 8 and 9 draw parallel to 1 3, touching the joint at 10 11. Now, with a flexible strip planed to ¼ inch at the one end, down $\frac{1}{16}$ at the other, draw the curve through the points 8 10 and 9 11, completing the mold. This is a very off-hand and expeditious way of drawing the curves, as it will be seen at a glance that the rod, when bent, forms an elliptical curve. This piece for the rail will require to be 6 inches thick, as the plane which the tangents produce is very steep, so that thickness in material is more essential than the width of the mold, as this is not drawn the full width, or as the bevels would produce, but is sufficient for practical use.

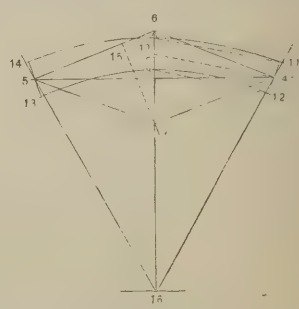
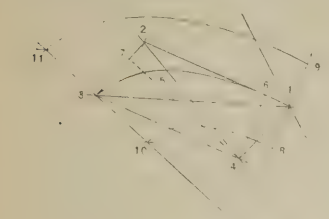


Fig. 16.—Mold for that Portion Indicated by Fig. 7 in the Plan and by E 7 in the Elevation.

Fig. 21 represents the mode of finding the width of the mold by the use of the bevels applied across the width of the rails, as at 10 11 and 8 9. To find the bevels for Fig. 17, draw the dotted lines at right angles from the tangents, as 6 4 and 7 4. Now extend the line A D, Fig. 18, indefinitely. Let C L, Fig. 18, equal 4 6; the angle formed at L is the bevel for the joint

1. Let C M equal 4 7; the angle formed at M is the bevel for the joint at 3.

We will next consider the mold, Fig. 20, elevation E 10 and Fig. 10 on the plan. For the major length, let 1 3 equal 0 5 elevation; with the compasses let 1 2 and 1 4 equal 3 4 elevation. Let 3 2 and 3 4 equal the same, as all these lines are of one



Self-Supporting Stairs.— Fig. 17.—Mold for the Starting Easement at the Newel, Shown at Fig. 9 in the Plan and by E 9 in the Elevation.

length; complete the parallelogram; connect 2 4; extend indefinitely; this is the minor length and the minor axis. Let 2 12 equal 8 Y of Fig. 10; connect 12 1 and 12 3 indefinitely; this gives the chord lines. Let 2 5 equal 8 12; 5 is now the center of the mold; set off half the width of the rail on each side, as 2 6 is the width. Now, to find

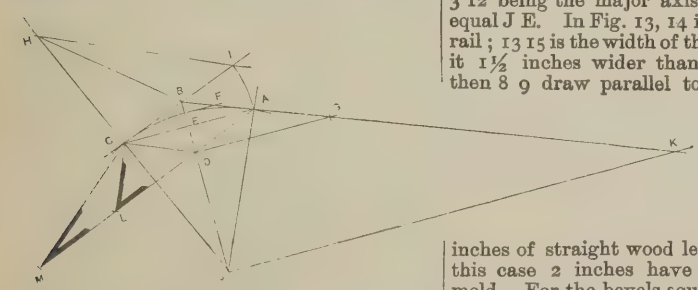


Fig. 18.—Ground Plan of Fig. 9 of the Plan, Enlarged to 1-Inch Scale, Corresponding to the Mold as Drawn in Fig. 17; also Found at E 9 of the Elevation.

the width of the mold at the end, draw the dotted line 5 1; draw 2 8 and 6 9 parallel to 5 1, touching the chord line at 8 9; mark the opposite end same width; now draw the curves through the points thus produced and complete the mold. For the bevel draw the dotted line 4 7 at right angles to 2 3. At Fig. 10 extend 8 9 indefinitely. Let 7 13 equal

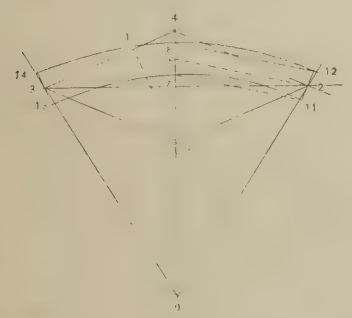


Fig. 19.—Mold Drawn from Fig. 6 of the Plan and E 6 of the Elevation. Four Pieces of This Pattern Are Required, Covering the Space from C to S of the Plan.

4 7; the angle formed at 13 is the bevel for both ends of the mold.

We will next consider the easement mold, Fig. 12, from the plan, Fig. 13; these figures are drawn to a scale of 1 inch to the foot, to cover the plan Fig. 11; the elevation is at E 11. Let J A, Fig. 13, be twice that of Fig. 11; all other parts the same. From J as center, describe A C; connect J A; also J C extended; draw the tangents at right angles from J A and J C; draw C D parallel to B A; draw A D parallel to B C, completing the parallelogram. Extend A D indefinitely;

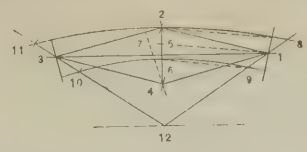


Fig. 20.—Mold Drawn from Fig. 10 of the Plan and E 10 of the Elevation. Four Pieces of This Are Required, Covering the Space from 3 to 11 in the Plan.

from C to H is the hight, and is double that of the elevation E 11, as shown at 11 11; connect H B, giving the length and pitch of the tangent. From C as center describe A I; connect H I, giving the major length. For the mold, Fig. 12, on the line B J erect perpendiculars at E D and J indefinitely. Let D G equal C H in hight; connect B G extended to the perpendicular from J, touching at K. To draw the mold let 1 3, Fig. 12, equal I H; let 1 2 and 3 4 equal H B. Let 3 2 and 1 4 equal B A; connect 2 4 extended indefinitely at 1; mark the joint at right angles from the tangent at 3 in the same manner, and extend, cutting the line 2 4 at 12. From 12 draw through 1, giving the chord line at 12 and at right angles to 3 12; draw the minor axis 14 12, 3 12 being the major axis. Then let 12 14 equal J E. In Fig. 13, 14 is the center of the rail; 13 15 is the width of the mold at 1; make it 1½ inches wider than the rail, as 8 9; then 8 9 draw parallel to 1 3, touching at 10 11, giving the width necessary; now, as this piece connects with straight rail on the level, there must be 2 or 3 inches of straight wood left on the rail; in this case 2 inches have been left on the mold. For the bevels square from the tangents to 4. Let B L, Fig. 13, equal 4 6; the angle thus formed at L is the bevel from the joint at 1. Let B M equal 4 7; the angle at M is the bevel for the end at 3. This completes the molds for the inner circle.

The molds for the outer circle are 14 15 16 19. The cap and the landing easement are treated in the same manner as those for the inner circle, and will require no further explanation, but we may proceed at once to produce the molds of Fig. 5 from the lines already drawn in the plan. Fig. 14 is the mold for Fig. 5 on the plan. Let 3 4 equal C D of E 5. Let 3 5 and 4 6 equal C B of E 5. Let 3 6 and 4 5 equal A B. Connect 5 6, extended indefinitely; draw the joint 4 at right angles from the tangent extended, cutting the line 5 6 at 14. Then 4 14 is the major axis. Draw from 14 the minor axis, at right angles from the major axis. Let 14 O equal G F of Fig. 5 for the center of the rail, and 15 16 the width of the rail. Connect 14 3, extended for the chord line; extend 14 6 5, on which is to be marked the width of the mold as the minor length at 6 5. Let 7 14 equal G F. Let 7 8 equal I J. Let 7 9 equal J K. Connect 7 3 and 7 4 as indicated by the dotted line. From 8 and 9 draw parallel to 7 3, touching the chord line at 10 11. Produce 12 13 in the same manner. Complete the mold by drawing the

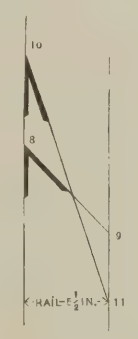


Fig. 21.—Diagram Showing the Width of the Mold for Fig. 17 as Produced by Applying the Bevel Across the Width of the Rail.

curve through the points indicated. The dotted curve lines 10 and 15 and 11 16 would be produced by the trammel. Find the bevels in same manner as already described for the other molds. Let R S on the ground plan, Fig. 5, equal 6 17. Let P O equal 6 18. The angle O is the bevel for the joint at 4, and the angle P R is the bevel for the joint at 3.

We will next consider mold, Fig. 19; elevation, E 6; plan, Fig. 6. Let 2 3 equal O D. Let all the sides of the parallelogram equal N O. Connect 4 5, extended as the minor axis. Let 4 9 equal N Y of the plan. Draw the major axis in the usual way. Connect 9 2 and 9 3, giving the chord line, on which the width of the mold is marked. For the center of the rail let 9 6 equal Y F. From 6 set off half the width of the rail both sides, as 7 8. Draw the dotted line 2 6 and the parallel lines 7 11 and 8 12. Make the opposite end the same width. Complete the mold by drawing the curve. For the bevels let D J, Fig. 6, equal 5 10; the angle at J is the bevel for both ends.

We will now give attention to the mold, Fig. 16; plan, Fig. 7; elevation, E 7. For the mold, let 4 5 equal U D. Let all sides of the parallelogram equal S T. Connect 6 7, extended. Let 6 16 equal T Y, of the plan. Connect 16 4 and 16 5, giving the chord line.

For the center of the rail, let 8 16 equal F Y of the plan; set off 9 10 for the width of the rail, and find the width for the ends in the same manner as for Fig. 19; draw the

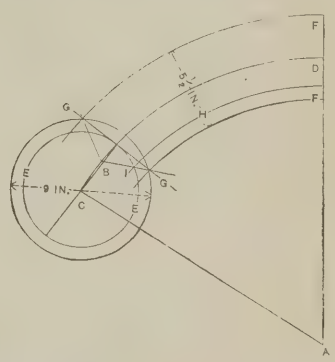


Fig. 22.—Diagram Showing How to Find the Miter for the Cap, and the Location of the Same for Determining the Direction of the Tangents, as A B and 1 2 of the Plan.

curve, and complete the mold. To find the bevel, let D L, Fig. 7, equal 7 15. The angle at L is the bevel for both ends of the mold.

The mold, Fig. 15, is shown in plan at Fig. 8, and in elevation by E 8. Let 1 4 equal U D; let 1 5 and 4 3 equal U V; let 1 3 and 4 5 equal V W; connect 5 3 extended; draw the joint 4 at right angles from the tangent and extend, cutting the line 5 3 at 12. Then 4 12 is the major axis; draw the minor axis through 12; connect 12 1, giving the chord line; for the center and width of the mold on the minor axis, let 12 O equal G F, Fig. 8; for the width and center on the minor length, let 6 12 equal K I; let 5 6 7 equal V K J; draw the dotted lines in the usual way for the width at the ends; this will join the straight rails on the level, and will require straight wood on the end of this mold; complete the mold by drawing the curve. For the bevels let D R equal 3 15; the angle at R is the bevel for the end at 1. Let P N equal 3 16; the angle at N is the bevel for the end at 4.

A Canadian exchange expresses itself as follows concerning the progress that is being made in architecture in this country: "The United States is soon going to take the lead of older countries in the matter of modern architecture, as it is natural that it should. A rapidly-developing country, constantly requiring new conveniences, offers the most promising field for the ablest men of the age, and scarce a week passes that the American illustrated papers are not adorned with pictures of some new public building, grand in extent, of original design and of surpassing beauty. The young Western cities which have sprung up within the æsthetic era are fairy lands as compared with new towns of 30 years ago."

Prospects in the Building Trades.

In the early spring season, when the building business is about to open, every one whois connected with any of the building trades, or who supplies materials or is in any business the prosperity of which is at all dependent upon activity in the building trades, anxiously inquires, What are the prospects of the building business this ysar? Is the country at large to have an active building season, or is it to be very dull? Such questions as these cannot be satisfactorily answered from any ordinary source of information. It requires a very painstaking search, and one that can only be accomplished by voluminous correspondence. For several years past we have undertaken each spring season to present to our readers a bird's-eye view of the prospects of the building business for the year, with some indication of rates of wages and with incidental attention to various other interesting features. These annual surveys have been based upon reports sent in by our subscribers and a large staff of special correspondents in answer to our questions. For the report for the present year we have taken unusual pains. We have sent out a larger number of inquiries than ever before. Every town in the United States having a population of 1000 or more has been considered, and our correspondence has been with nearly 4000 persons. While the population of a town is not necessarily the measure of its importance as a building center, it perhaps affords the best basis for such a report as we have undertaken to prepare, and therefore it has been adopted in this case. The replies that we have received from our correspondents this year are fuller and more complete than we have ever before had, and accordingly we feel that we are in a better position to convey a true conception of what the building business is to be during the season just opening than ever before.

THE GENERAL OUTLOOK.

From the most casual inspection of the multitude of letters which we have received it is evident that the present is to be fully up to the average as a building year. In very few sections of the country, however, do we hear of what may be described as a building boom. Some of those towns which have been so unfortunate during the past year as to have a considerable portion destroyed by fire present unwonted activity, and a few towns in sections of country that are being opened up by new railroads, or where new mining enterprises are being started or unusual developments of other industries are taking place, are the scenes of very active operations. For the most part, however, building seems to be upon a very stable foundation. The speculative element is not much alluded to by our correspondents, and those building which are being put up, whatever may be the section of the country, seem to be in direct response to actual requirements. While the general volume of building throughout the country at large will probably be fully up to the average, it is not to be inferred that all sections of the country will share equally in the general prosperity. There seems to be complete stagnation in the building business in some portions of the country, notably in certain of the Southern States. Just what portions of the country are to be most prosperous, and what sections will probably do very little, will be shown by what follows.

LATENESS OF THE SEASON.

Many of our correspondents direct attention to the fact that, owing to the lateness of the season the present year, the 15th of April was rather early to give a satisfactory account of the building outlook. The lateness of the season seems to affect the country very generally. It is as noticeable in our reports from the South as from the North, and is alluded to as frequently by our correspondents in the Central States and extreme West as in the East.

WAGES.

With reference to wages it may be said that there is no probability of any material advance in any section over the rates commanded last year. On the contrary, there seems to be a weakening in rates in many directions, and the expectation of rates ruling somewhat lower through the season than those which were current last year is expressed by many of our correspondents, especially by those in the smaller towns where business is not very active. In the large cities, where unions control rates almost exclusively, full figures will probably be maintained. On the other hand, any attempt to force rates higher will result disastrously, and will stop many enterprizes that will otherwise go forward. In general it may be stated that rates in those towns where building is to be more than the average during the present season will be about the same as ruled last year. On the other hand, where building is at all slack, rates may be from 10 to 15 per cent. lower than last year. In the towns in the extreme West, especially in the mining districts, and also in the Southwest, on the extreme outposts, so to speak, rates are named by our correspondents which seem extravagantly high in comparison with those rates which are paid for like work in the Central and Eastern States. When the surroundings of the work are considered, however, the cost of living, and the uncertainty of steady employment, it is believed that those mechanics who receive the high wages named are in reality far less favorably placed than many in the older sections of the country who receive wages represented by figures no more than half as great. It would be very difficult to present a reliable table of wages showing rates throughout the country, on account of the difference in customs in different sections. Not a few of our correspondents, having in mind country work, in which the mechanics in their towns are largely engaged, report wages at certain figures, board included. Others quote wages at eight hours, while still others allude to the fact that in their localities, for certain classes of work, notably masonwork, brickwork and plastering, it is almost the universal custom to agree by the perch, by the 1000 or by the square yard, as the case may be, and not at day's wages.

SMALL MARGINS.

Another fact to which many of our correspondents allude is that building operations during the present year for the most part will be conducted on very small margins. Materials are cheap, labor in many cases is low, and yet in spite of these conditions the pressure is for buildings at such low cost as to leave comparatively small margins in the hands of the contracting builders. We think, however, that in many cases these margins are small only in comparison, rather than in reality. Where high prices have ruled for a considerable period and low prices succeed them, even though the same percentage of profit may be made, the feeling exists that times are hard and margins are small. Our impression, based upon many reports before us, is that the present year will be one fully up to average profits for contract builders, and that those mechanics who are accepting slightly less wages the present year than for former years will yet find themselves at the close of the season fully as well off as heretofore. Everything is being conducted on a lower basis than heretofore.

THE NORTH ATLANTIC STATES.

We have scarcely room to summarize each individual State. The best we can do is to give a general view of the country in sections. Commencing at the extreme northeast and taking into account that group of States known as the North Atlantic States, comprising Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island, it seems that the building trades throughout the territory named are in about the average condition of the country at large. In the State of Maine, for the most part, the outlook is not favorable. This in part, no doubt, is due to the early date of our advices, considering the latitude of the State. Several of our correspondents allude to the fact that the building business, in many instances, does not commence until late, and that people scarcely know yet what will be done. Wages throughout Maine average very much as they did a year ago, and no very great changes are anticipated during the season. In New Hampshire the outlook is somewhat better, and the same satisfactory condition extends into many of the towns in Vermont. A fair trade is anticipated at the capital, also at St. Johnsbury and in several of the other more important towns throughout the State. In Massachusetts both good and bad reports are at hand. In those towns where manufacturing is prosperous a fair amount of building is anticipated, and in those which have apparently got their growth, for the time being at least, mechanics are for the most part engaged upon repairs and alterations, so that they are not particularly enthusiastic. Dwellings are mentioned by our correspondent as being largely in demand. Connecticut is in much the same condition as Massachusetts, while Rhode Island reflects the general prosperity of the district of which it is a part. Building in Providence promises to be fairly good, with no material change in rates of wages.

NEW YORK.

The general average throughout the Empire State is perhaps as good as through any State from which we have reports. There are very few towns of any importance in New York that report less than a fair trade. A notable exception to this, however, is Albany, in which our correspondent says there will be but little done in comparison with former years. The average wages of carpenters may be given at about the same figure as last year—namely, $2.25 per day. In New York City wages rule higher, but, considering the cost of living, it is probable that the mechanics of the metropolis do not any more than keep even with their friends in the country. In New York City it is estimated that there will be a slight falling off in the amount of building this year as compared with last year—that is, measured by dollars. When the area covered or the material consumed is considered, however, it is possible that the shrinkage will be less noticeable. Based on the estimates and plans filed during the first quarter, it would appear that residences on the west side of the city and a large number of improved tenement houses, variously located, will be the leading features of this year's business. Many of our correspondents in this State refer to the lateness of the season, which has greatly retarded building operations. Several allude to the fact that frost was yet deep in the ground at the time of writing (from the 12th to the 15th of April).

CENTRAL ATLANTIC STATES.

New Jersey does not seem to share the general prosperity of the Empire State, although the prospects are not specially depressing. The outlook in many of the towns at pressnt seems to be less favorable than a year since. In Pennsylvania, on the other hand, the prospect is about as favorable as through New York State. All the towns and cities of real commercial importance from which we have reports indicate that trade will be fully up to the average, while a number of them anticipate an unusually satisfactory season. In Philadelphia the outlook is favorable, and wages, it is expected, will range at about the same rates as were paid last year. The outlook in Delaware is considered scarcely up to the average. Some towns in Maryland report a very good trade in prospect, while others anticipate only an average business. Building operations in Washington are not far from the average, with some important public work in contemplation. A few of the towns in Virginia anticipate a good trade, while many of them are comparatively at a standstiil. In West Virginia the condition is much the same. The outlook is considered very gloomy in Wheeling, owing in some measure to changes which have been made in manufacturing operations. The substitution of steel for iron has had a depressing effect, since many mechanics are thrown out of work in consequence. It is presumed that, after the industries have bacome readjusted to the new order of things, prospects in the building business will improve. That city, and some others in the Ohio Valley, suffered severely

a year since by the flood and have scarcely recovered from that disaster.

SOUTH ATLANTIC STATES.

In the South Atlantic States, embracing North and South Carolina, Georgia and Florida building is far less active than throughout the Central and Western States, and yet in comparison with what has been done in some seasons the outlook may be considered as very favorable. In a number of towns in North Carolina the present outlook is reported as superior to that of a year ago. This is also true in part of South Carolina, although many of the towns in that State manifest very little activity. In some respects Georgia seems to be continuing, to a restricted degree, perhaps, the industrial prosperity which has characterized that State for a number of years past. No very large enterprises are reported, but our correspondents seem to think mechanics will be fairly well employed during the season throughout the towns of that State. In Florida there will be some summer hotels erected, as usual, and some residences, but, aside from the demand for buildings of this character, very little outside of the ordinary will be done. The town of Palatka, well known to many tourists, presents unwonted activity on account of the rebuilding in progress, made necessary by the fire which destroyed the business portion in November last.

THE GULF STATES.

Of the Gulf States, Alabama presents a somewhat favorable outlook in a few of its towns, although in general building operations will not exceed the general average. Our correspondent from Montgomery says that building in that city is better than it has ever been before. The work is principally in dwellings, indicating general prosperity of the inhabitants. The outlook in Mississippi is not unlike that of a year since. Many of the towns are in a state of absolute inactivity, and there is little industrial enterprise of any kind in any direction. In Louisiana the outlook is much the same. The unwonted activity in New Orleans, incident to the preparations for the cotton exposition, has been followed by a state of stagnation. We are assured that less building will take place in that city this season than before for several years. The interior towns do not offer any compensating advantages. In Tennessee the outlook is not considered favorable, and in many towns there will be comparatively little done. Nashville, Chattanooga and Knoxville will probably do about as much as usual, although our correspondents are not specially sanguine. Our reports from Arkansas are favorable. The outlook in many of the towns is better than the average, and, as contrasted with the reports of a year since the outlook is very bright indeed. Wages at the present time and through the winter have ruled in many cases less than during last year, but it is expected that as soon as the season is fairly opened rates will be restored.

THE SOUTHWEST.

Our reports from the Lone Star State are various. Some of the towns in those portions of Texas which are old in comparison with others more recently settled indicate that a fair amount of building will be done, although there are exceptions to this rule. The rates of wages quoted are for the most part high, in comparison to those paid throughout the Eastern and Middle States, and yet the prospects for steady work, which are oftentimes quoted as less favorable than the present building activity would seem to indicate, prove that these rates are only fair under the circumstances. New Mexico, lying to the northwest of Texas, is in some respects a portion of the same general territory. The western part of Texas is largely devoted to the cattle business, as is also New Mexico, while both of the States in a certain sense are affected by the proximity of the sister Republic, Mexico, on the south. Throughout the territory of New Mexico the building outlook is very poor, from the fact that the industries of that section do not demand good buildings. Adobe huts seem to meet the general requirements, and our correspondents do not attempt to quote mechanics' wages. In Montana the outlook is better in some respects, although there is not very much doing at present.

THE CENTRAL BELT.

Returning to the central part of the country, Ohio, Indiana and Illinois, severally and collectively, present a very favorable outlook indeed. There are few towns, comparatively speaking, throughout this belt in which mechanics will not be comfortably employed throughout the entire season. Wages are expected to rule about the same as quoted a year since. The lateness of the present season is specially mentioned by our correspondents in Illinois and Indiana. Lower wages are quoted in many portions of these two States as ruling at present and through the winter than last season. In most of them it is anticipated, however, that old rates will be very nearly, if not entirely, restored. In a few of the towns in Illinois where building is not reported as very active the explanatron is offered that poor crops have delayed many enterprises that will probably go forward the latter part of the season in case crops the present year are good. Towns in which building was the most active last year show a falling off the present year, indicating that in some instances regular growth has been more than anticipated, and that building enterprises must wait until the demand overtakes them. A correspondent from Chicago says that the demand at present in that city is largely for cheap tenements and small dwelling-houses. Indications are, however, that as the season advances there will be much more activity among landholders in erecting dwellings of a better grade. "Flat houses are also in demand in Chicago, and a number of enterprises of this character are on foot for the present season. The outlook in Chicago at the present time is hardly as favorable as a year since, for at that time more extensive buildings were contemplated than at present. It would seem, however, that the city will come very near doing an average amount of building during the season. Work will be plenty for all mechanics in the building trades in that city, unless some misunderstanding arises as to wages. At the present time, however, there are many unemployed men in Chicago. Public work is mentioned in a number of towns through the States last mentioned, as also in Kentucky. For the most part Kentucky seems to share the same general prosperity as characterizes the States just north of the Ohio River. Our reports for this State are very favorable indeed; the same general conditions apply to Michigan. Wisconsin seems also to be prosperous, and without an exception every town from which we have heard in that State reports building as fair or above the average.

THE NORTHWEST.

Of the States immediately west of the Mississippi, commencing with Missouri, on the south, good reports have been sent in. Missouri seems to be fully up to the general average, and Iowa occupies the same general rank. Some of our correspondents refer to the temperance legislation in the latter State as affecting building enterprises unfavorably. Just how this occurs we are unable to explain, and mention it only as an incident. The great Northwest as typified by Minnesota does not yet seem to be overdone. Building prospects throughout this State are reported good. Our advices from St. Paul are to the effect that the building season has fairly begun and that a great deal of work is already in progress. There is scarcely a block in the city, it is said, either in the heart or the inlying districts, in which improvements are not to be made during the summer. A large number of contracts have already been let, and builders are reported to be well satisfied with the prices they are getting. In Minneapolis the outlook seems to be even more promising. The building permits granted in the three months ending March 31 aggregate almost $1,000,000. Inasmuch as these permits are generally estimated at a figure far below the actual value of the improvemen's, our correspondent argues that the work really in progress at the present time is not far from $4,000,000 in value.

Although Dakota has been overdone in some respects, a considerable number of her towns are still growing. In the main Dakota has been more rapidly developed from an agricultural standpoint ihan in respect to towns and cities. It would seem, therefore, that her mechanics have good prospects before them for some years to come, unless some unfortunate calamity overtakes this section of the Upper Missouri Valley. The towns in the valley of the Platte, Nebraska, also seem to be fairly prosperous. We have no unfavorable reports from that State, although there are several towns of importance from which reports have not reached us at this writing. In Kansas the outlook is more diversified. Some of the towns and cities report the prospects as very favorable while in others it is discouraging. It would appear, all things considered, however, that the building business in this State for the year will be about up to the average. Complaints of the backwardness of the season are mentioned by many of our correspondents throughout this State.

THE MOUNTAIN STATES AND TERRITORIES.

Considering the next section of territorial divisions as laid down on the maps, we reach Colorado, in which the outlook would seem to be only about average. Mining enterprises have lost some of the speculative energy that characterized them a short time since, and building enterprises are correspondingly less in proportion. A few of the cities and towns throughout this State indicate considerable activity, while others are more nearly at a standstill. In Utah many enterprises in building, particularly some of those conducted by the Mormons, are apparently at a standstill, owing in some measure to the adverse decisions of the courts affecting the governmemt of that Territory and its peculiar institution. Mechanics are reasonably busy in Salt Lake City, and many repairs and alterations are in progress there, which, with some new work, give considerable activity to the building trades. Our correspondents think that the lull will not continue for any great length of time, but that, with questions that have been long pending definitely settled, building activity will be resumed. Wyoming Territory has but five cities or towns that come under our specification. In these building is reported as about up to the average. In Montana the outlook is less promising, while in Idaho the conditions are about the same. Mining operations in Nevada are less prosperous, perhaps, than some time in the past, and some of the towns which sprung up mushroom-like have already lost their population, and there is not a corresponding demand in other directions. Most of the mechanics in the larger places will find employment throughout the season, but no very great activity is anticipated at any point.

THE PACIFIC COAST.

Building is active in San Francisco and in some of the other cities and towns of California. More than the average, probably, will be done throughout this State the present year. Our reports from California and other portions of the extreme West are the least satisfactory of those that have come to hand, owing to to the long distance to be traveled and the short time we could allow them on account of the early date of going to press. A fair amount of building, it would seem, will be done through Oregon and Washington Territory, although we have not the same abundant particulars as from sections nearer by.

The above account, long as it is, is a very brief epitome of a very large number of lengthy and circumstantial reports that we have received from our correspondents. As intimated at the outset, the responses to our inquiries have been more satisfactory the present year than ever before, as well as more in number. It is a matter of regret that we have not the space to present many interesting particulars of local building enterprises which our correspondents have sent us. We take this occasion to thank one and all for their favors, and to assure them that items of this kind are quite acceptable, even though we are unable, for lack of space, to lay them before our readers.

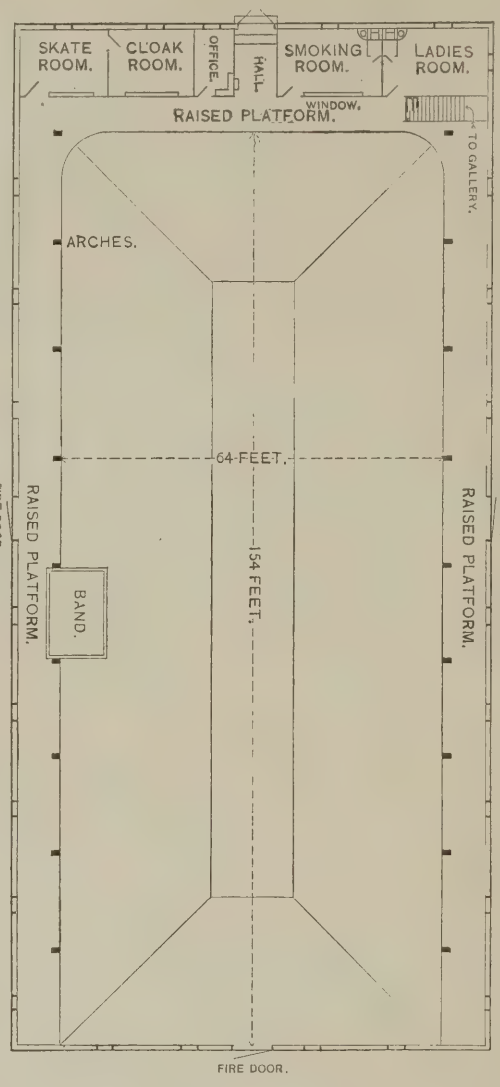
CORRESPONDENCE.

Roller-Skating Rink.

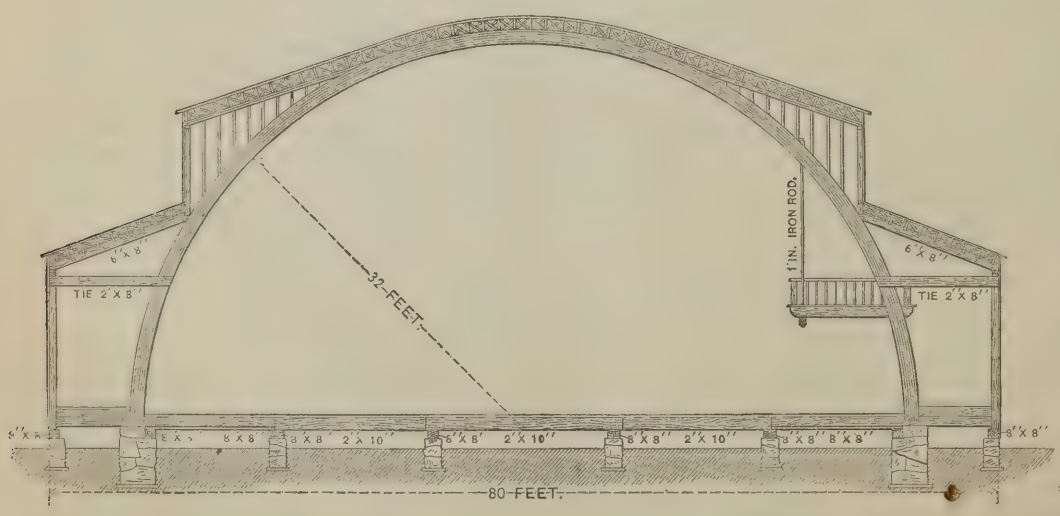
From JOHN COWING, *Cleveland, Ohio.*—I inclose drawings and specifications for a roller-skating rink which has just been completed in this city at a cost of about $4000, exclusive of painting. I think they may be of interest to some of your readers. You will notice by the plans and specifications that in case the piers which support the arches should settle there will be no liability of the skating floor settling.

Note.—The accompanying engravings have been prepared from the drawings sent by our correspondent. We have scarcely space to publish the full specification which he incloses, but glean the following items from it, which no doubt will be of interest to our readers:

The building is 80 x 172 feet, outside measurement, affording a skating surface of 64 x 154 feet. The sills are of solid timber, 8 x 8 inches, Norway pine. The foundations consist of stone piers 14 x 14 inches, 24 inches deep and 18 inches in the ground. These are in eight rows, extending the entire length of the building, 6 feet apart. The piers under the arches are 24 x 24 inches in size, and are 36 inches deep. The joists of the skating floor are 2 x 10 inches in size, placed 16 inches between centers. They are 14 feet long, and lapped together and thoroughly spiked. The chords running from arch to arch on each side of the building the entire length to support the roof are of 4 x 10 timber properly gained into the principal rafters. From each arch to the outside studding a 2 x 8 inch tie is spiked. The building is covered with drop siding, from 6-inch C strips. The roof projects 6 inches, and is finished with a plain barge board and facia. The skating surface is covered with an under floor of common pine boards, surfaced and laid diagonally. These are nailed to the joists and are covered with felt. The skating floor is of dry, matched, clear maple flooring, ⅞ inch thick and 2½ inches wide, blind-nailed on bearings and smooth-planed and sand-papered after laying. The maple floor was laid with mitered joints at the corners, and with a rectangular space 14 feet wide in the center. The floors in the galleries and of the platforms are of common pine matched. The roof is hipped back from the end walls, which are 26 feet 9 inches high to the first arch. The entire roof is covered with cement roofing. The building has nine arches, located as shown on plans. These are 33½ feet high and measure in section 10 x 15 inches. The arches are built of 1 x 10 inch boards, planed and jointed, and fastened together with 10d. and 20d. nails. The feet of the arches are gained 2 inches into the cross-sills. The opposite cross-sills are connected together by 2 x 10 tie-joists. The ladies' and gentlemen's rooms are provided with a marble-topped washstand, and each has a water-closet with proper connections. The music stand measures 10 x 16 feet between two of the arches. It is situated 7 feet 6 inches above the skating floor, and has a rail well fastened to the arches. The building has four chimneys 16 x 20, with flues properly provided with thimbles.



Plan of Roller-Skating Rink.—Scale, ½ Inch to the Foot.



Roller-Skating Rink, by John Cowing.—Transverse Section.—Scale, 1/16 Inch to the Foot.

Construction of Ice Boxes.

From L. E. B., *Pittsburgh, Pa.*—Please inform me, through *Carpentry and Building*, if an ice box or refrigerator should have a place for admission of air from the outside, and also a place for the melted ice to run off? What I desire is to know the principle upon which such construction should be based, and then I can work to plans of my own, making the addition of any special features that are desirable.

Answer.—All the ice boxes and refrigerators with which we are acquainted have some provision for the melted ice to run off. In most cases a simple pipe is used, so bent or turned as to form a trap, and thus prevent outside air from entering through the aperture. With reference to the admission of outside air into the refrigerator, it is attended with some difficulty if a loss of ice is to be avoided. The object of all refrigerators is to do the greatest amount of work with the least consumption of ice. The more air that is admitted from the outside, whether through careless construction of the apparatus or by reason of frequent opening of the door, or through ventilators provided for the purpose, the more rapid will be the consumption of ice. There are objections to the admission of air from the outside on other grounds. Ice boxes and refrigerators are frequently located where the surrounding air is not of the sweetest and purest character. This being the case, the admission of outside air would result in more or less damage to the contents of the refrigerator. It is well known that milk and some other articles that are ordinarily kept in such places are very susceptible indeed to damage from impure air, and frequently very serious results follow contamination of this kind. Sometimes the waste-pipes of an ice box are carelessly connected with the sewer, and sickness in the family is introduced by this bit of carelessness. Some of the best refrigerators we have ever examined are so constructed and arranged as to maintain a circulation of air within the refrigerator. This can be acomplished in apparatus of a larger size without the necessity of taking in outside air. Circulation of air within the refrigerator is exceedingly desirable, because only by such means can an equitable temperature be maintained. In some cases we have known of the circulation being created and sustained by the use of a small gas jet or lamp within the refrigerator. Of course in such cases care must be taken that the products of combustion find their way out without contaminating the air within the refrigerator. All that is wanted from the lamp or gas jet is enough heat to give a column of air motion, and so little is required for this purpose, when the general low temperature of the inclosed air is considered, that it is found a small gas jet may be employed for this purpose without material loss of ice, and greatly to the advantage of the apparatus. We trust these remarks may furnish our correspondent the information he wants. We have purposely made them very general in their nature, because we understand that to be the character of his requirements at this time.

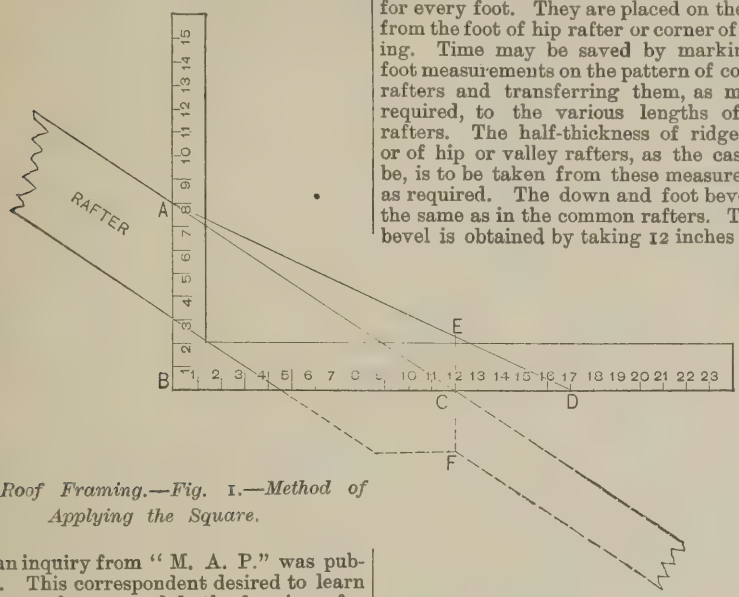
Strain on Derrick.

From D. W., *Caledonia, Mich.*—Referring to the answers to the question proposed by "G. F." in the February number of *Carpentry and Building*, about "Strains on Derricks," which were published in the April number, it is evident that either I or "F. E. J.," of East Ridge, N. H., did not correctly understand the question. The answer of "F. E. J." is correct where the strain is regarded as being on the derrick

alone. My reply to the question was based on a less comprehensive view, and related to the ropes and pulleys. It is possible that "G. F." may have proposed the question in the sense in which it was understood by the other correspondents, although I understood it differently.

Hip Roof Framing.

From A. L., *Fairfield, Iowa.*—In the May number of *Carpentry and Building* for last year an inquiry from "M. A. P." was published. This correspondent desired to learn how to get the cuts and do the framing of a roof with hips and valleys, using only a carpenter's square. I read the Editor's note with reference to the question, but presume that this subscriber, like other readers of *Carpentry and Building* with whom I am acquainted, fails to see anything in the variety of hopper-bevel problems that has been published that gives him any insight to their use in roof framing. I venture, therefore, to submit the following, in which the hips and valleys are at an angle of 45° with the eaves. Suppose the roof to be one-third pitch, or, in other words, to have 8 inches rise to the foot; then take 18 inches on the tongue of the square and 12 inches on the blade, and apply to the rafter as shown in Fig. 1 of my sketches. Take this measure as many times as there are feet in half the width of the building. This will be the length of the common rafter without the projection. This is to be added as indicated by the dotted lines. The bevel for the top of the rafter is indicated at A, and for the heel of the rafter at C.



Hip Roof Framing.—Fig. 1.—Method of Applying the Square.

To get the length of hip and valley rafters change the measure on the blade of the square from 12 to 17 inches, as shown by A B D in Fig. 1, and take this measure the same number of times as for common rafters. The down bevel for top of rafter is at A, and for heel is at D. Take the measure of the hip rafter to the point of miter at the top end when mitered to fit ridge board. Half of the thickness of the ridge board is to be taken off of both hip, valley and common rafter measurements. This will be better understood by examining J K of Fig. 3 of the inclosed sketches. The plumb-line C F, Fig. 1, stands plumb over the face of plate, and must be the same length in hip and valley rafters as in common rafters. This makes the projecting part of hip and valley rafters wider than of common rafters.

To get the length of the jack rafters apply the square the same as for common rafters, as indicated at A B C, Fig. 1, once for every foot. They are placed on the plate from the foot of hip rafter or corner of building. Time may be saved by marking the foot measurements on the pattern of common rafters and transferring them, as may be required, to the various lengths of jack rafters. The half-thickness of ridge board or of hip or valley rafters, as the case may be, is to be taken from these measurements as required. The down and foot bevels are the same as in the common rafters. The top bevel is obtained by taking 12 inches of the base B C on the tongue, and 14½ inches (nearly) of hypothenuse on the blade A C, Fig. 1, and applying it as shown by G H I of Fig. 2. The top bevel of the jack rafter is at I, while G gives the face bevel for sheeting. Eight and 14½ inches taken on the square in the same manner, marking out 8 inches, gives the edge bevel of the sheeting. The top bevel of hip and valley rafters is obtained in the same manner as for jack rafters, only it is treated as a jack rafter in a flatter-pitch roof. From this it may be laid down as a rule that the base and hypothenuse of a right-angled triangle forming the pitch of any roof or rafter taken in any proportion on the tongue and blade of a square, and applied as shown by G H I of Fig. 2, will give the top bevel of hip, valley and jack rafter, as also the bevel of the hip and valley shingles and for mitering a raking frieze.

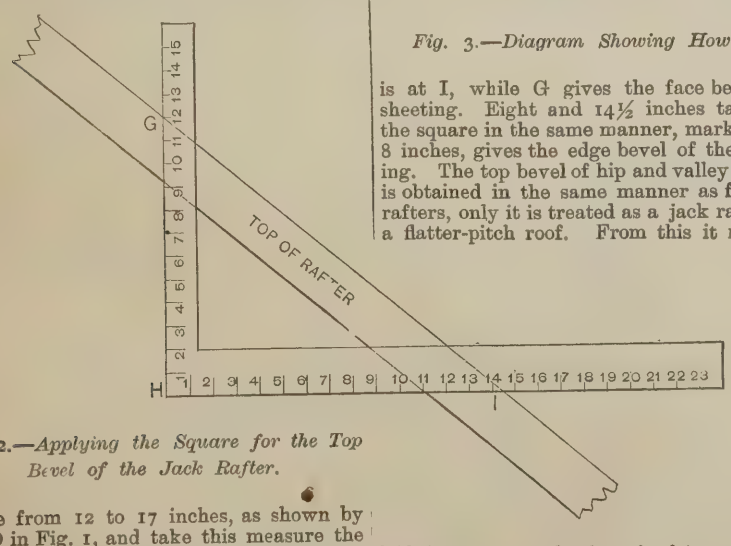


Fig. 2.—Applying the Square for the Top Bevel of the Jack Rafter.

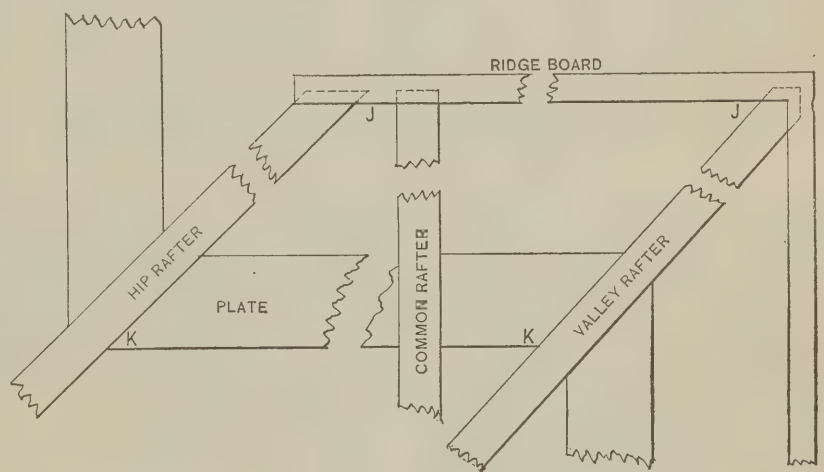


Fig. 3.—Diagram Showing How Measurements Are to be Taken at the Ridge.

Raking Cut.

From J. B. G., *Louisville, Ky.*—In answer to the inquiry of "D. P. W.," Chippewa, Wis., for raking cut, one-quarter pitch and one-third pitch, I would say that the cut for one-fourth pitch will be 4 x 4 7/8 inches; the cut for one-third pitch will be 4 x 4 13/16 inches. This will be the cut across the top of a miter-box, 4 inches inside measurement, using one-quarter and one-third pitch for the side of the box. Cut the level mold square miter

Prepared Paints.

From G. C. W., *Tangerine, Fla.*—Who makes the best prepared paints? Are any of the prepared paints in the market better than white lead and oil? This latter question is asked upon the supposition that an inexperienced person is to do the painting.

Answer.—It is impossible for us to point out which is the best-prepared paint, from the fact that we have not tried all of them personally. If we had positive information upon this point it would hardly be the thing to publish the answer to the question as our correspondent has put it. What we considered the best might not be equally satisfactory to some one else. We are safe in saying, however, that nearly all of the leading goods of this kind in the market are giving satisfactory results to a large class of consumers. With reference to the relative advantage of prepared paints and white lead and oil, we should unhesitatingly give the preference to a good prepared article over the raw materials where an inexperienced person is to do the painting. The best white lead and the best linseed oil are undoubtedly as good materials for painting as are to be had at the present time. The proper mixing, especially where color effects are desired, is altogether another matter. Ready-mixed paints save the risk of incompetency in this matter, and have the advantage of being prepared in a large establishment where the best talent is employed. Many important public buildings, as well as many of the best private residences, are at present being painted with prepared paints, and in our own experience we have given the preference to prepared paints over white lead and oil, in some instances, even at a higher price for the former, considering the fact that we had only a painter of average ability to mix and apply. The result has been altogether to our satisfaction.

Terne Plate for Roofing.

From P. J. R., *Jacksonville, Oregon.*—Please inform me if leaded plate makes a good roof? Will IC leaded plate make a satisfactory roof or not? What quality of tin plate and what size would you recommend for roofing purposes?

Answer.—From our own experience we believe that terne or leaded plates thoroughly coated and carefully worked make as satis-

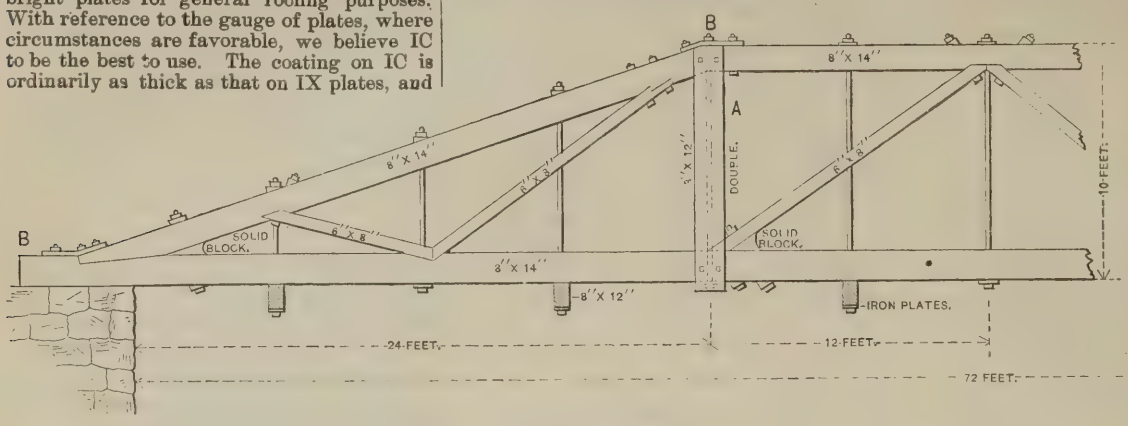
factory roofs as bright plates. We would carefully paint the roof, whether leaded or bright plates were used. There is an advantage in the cost in favor of leaded plates without any offsetting disadvantages. Because they are very generally used for roofing purposes, leaded plates are very commonly called roofing plates. It is only occasionally that a roofer is met who prefers bright plates for general roofing purposes. With reference to the gauge of plates, where circumstances are favorable, we believe IC to be the best to use. The coating on IC is ordinarily as thick as that on IX plates, and at the same time the amount of iron in IC plates is sufficient to withstand all ordinary strains. We have frequently seen IX plates used in gutters and valleys, while IC was employed in covering the principal surface of the roof. This combination is favored by many roofers, and seems to work very satisfactorily. Replying to our correspondent's last question—namely, What quality of tin and what size sheet we would recommend for roofing purposes?—we would say that nothing short of the very best quality should be employed. More especially do we emphasize this statement when roofing plates are as cheap as they are at the present time. There is very little excuse for using cheap plates. The size of the sheet makes much less difference than many suppose. Those who advocate small plates (14 x 20) object to the larger plates (20 x 28), because it is more difficult to fasten the latter thoroughly on account of greater space between the seams. Those who favor the larger plates call attention to the presence of more seams where the smaller plates are used, and consequently the greater liability to leaks. It is well known that the seams are the places where tin roofs first give out. Other arguments of a similar character could be advanced for and against each size plate, but when they are all summed up it would seem that there is comparatively little choice. We are very favorably disposed toward the larger plates from our own experience, especially for standing-seam roofing. The very best workmanship and the employment of plenty of cleats in fastening the sheets to the roof boards really determine the question of quality, irrespective of size of sheets.

Blackboards.

From D. S., *Elliott, Iowa.*—With regard to blackboards, about which "J. Q. B." inquired some time since, I would recommend ⅞ x ⅞ inch strips, dressed and put together with glue, each strip being nailed to the adjacent strips until the desired width is obtained. After the pieces are united in united in this manner, smooth up and sandpaper. Then paint and finish with liquid slating. The result will be a good board, provided seasoned lumber is used in the strips. I have built a number of blackboards upon this plan which have given excellent satisfaction.

Bridge Truss.

From S., *Mount Vernon.*—I take the liberty of submitting the inclosed sketch of a bridge truss in answer to your correspondent from Lancaster, Pa., and for the criticism of your readers. The diagram explains itself with the following exceptions: The post A should be made of 3 x 12 inch plank bolted on either side of the truss, top and bottom, with ⅜-inch bolts. The iron plates B will be found to be far better than the wooden blocks, as they prevent the timbers shifting from jar, and to some extent protect the wood ends from the weather. In order to avoid the splice in the center of the span, I would advise that the tie beam or chord be made of four 2 x 14 inch planks bolted together, as shown in Fig. 2, using ¾-inch bolts and breaking joints. With reference to sagging of the bridge, shown by your correspondent, the trouble is doubtless due as much to the lack of spring or rise when the bridge was built as to the undoubted weakness of the structure. I would recommend at least 5 or 6 inches spring to allow for the compressibility of the wood ends, especially where spruce or other soft wood is employed.



Bridge Truss Design Submitted by S.—Fig. 1.—Elevation.—Scale, ⅛ Inch to the Foot.

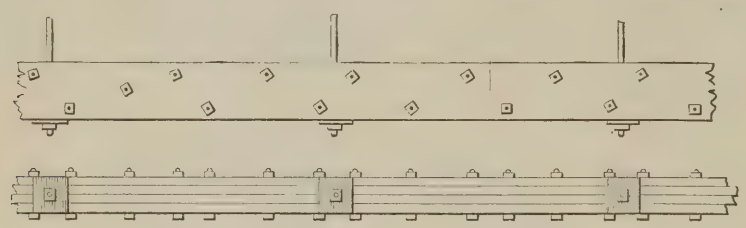
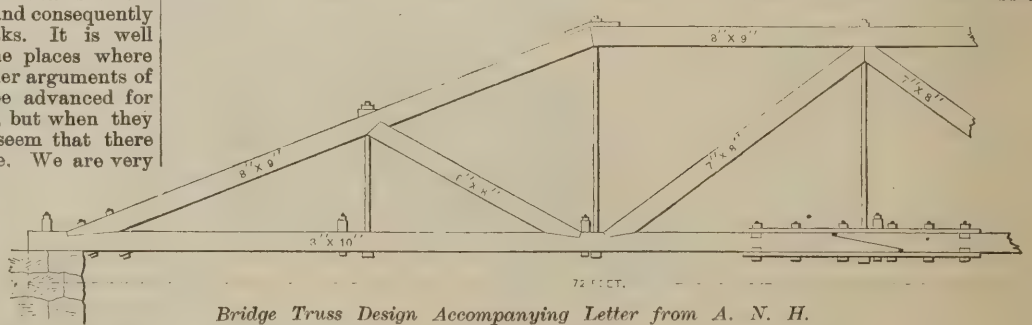


Fig. 2.—Side and Bottom View of Chord.

From A. N. H., *North Adams, Mass.*—I inclose a sketch of bridge truss in answer to your Lancaster correspondent. The splice is strengthened by bolting a hardwood plank, 5 x 8 inches, 10 feet long, on both upper and under side of chord. Keys are let into the chords. These keys are 3 inches thick, 10 inches long by 8 inches wide, and all are bolted firmly together with eight bolts, ⅝ inch in diameter, using cast washers with 3-inch face ¾ inch thick. The knee beams C C are 8 x 10 inches, placed on top of truss and bolted down with ¾-inch bolts. The design also contemplates joists 6 x 7 inches and a floor of 3-inch plank.



Bridge Truss Design Accompanying Letter from A. N. H.

Mixing Lead and Oil.

From S. A. M. & Bro., *Steward's Mill, Texas.*—Will you please publish in *Carpentry and Building* some data on mixing lead and linseed oil? Is raw oil or boiled oil best for use on inside painting? Is it expedient to use a drier? If so, what is best for the purpose? These questions no doubt may sound very simple to practical painters, but in this particular corner of the country the carpenter is compelled to superintend the painting, and accordingly needs to be well posted. We have had work done by men claiming to be first-class painters which was unsatisfactory in character. While the outside painting would dry nicely, the inside would never dry at all. If you will throw some light on the questions raised you will confer a favor.

Note.—Some of the readers of this journal who are painters may perhaps be able to answer the questions proposed above more to the satisfaction of our correspondents than anything we can say. They want the every-day practical rather than the theoretical. We feel disposed, therefore, to refer the questions to them for reply. However, in order not to keep the inquirers waiting an unreasonable length of time, we append some general directions. An experienced painter recommends for outdoor work as follows: Mix the white lead to a milk-like consistency with linseed oil. Raw oil is preferable for the purpose. A small amount of turpentine may be added to cause the paint to spread easily, or a light-brown japan may be mixed with it to hasten the drying. A paint thus composed is suitable for houses, fences and all like purposes. The same authority recommends as follows for indoor work: White paint for the inside of the house should never be mixed with oil, for if it is, and the room be closed or darkened, the paint will turn dark or yellow. Turpentine alone should be used, except that a very little japan dryer may be added to make it dry quickly.

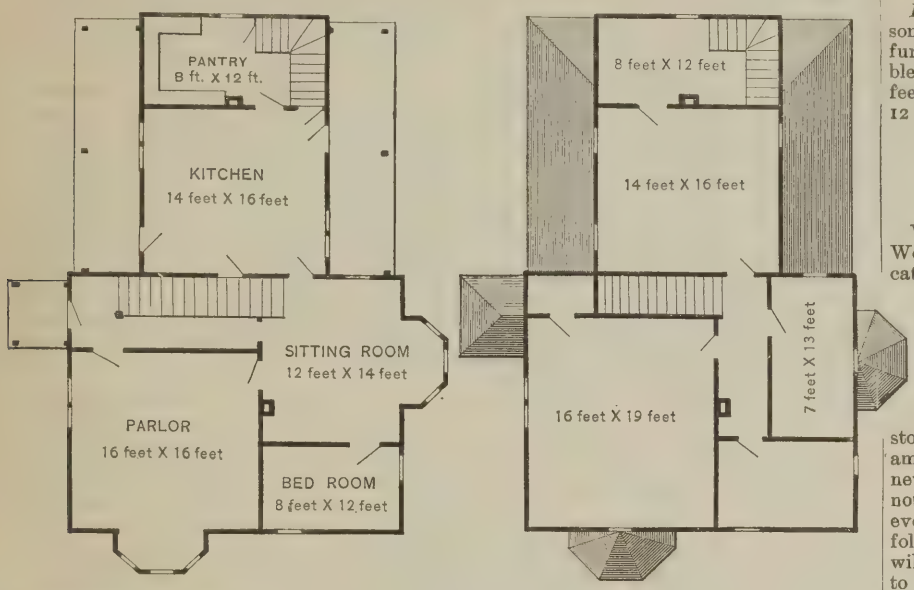
Removing Ink Stains from Marble.

From G. H., *Narrowsburg, N. Y.*—I notice the inquiry of your correspondent at Cambridge, Mass., for some recipe for removing ink stains from markle. I inclose one or two methods which I believe will be found to his advantage. Brush the dust from the marble with a piece of chamois. Then apply with a brush a good coat of gum arabic of about the consistency of thick mucilage. Expose it to the sun or wind to dry. In a short time the gum will peel off. Then wash the marble with clean water and wipe with a clean cloth. If the first application does not have the desired effect it should be repeated.

Another method is to rub the marble with the following solution: Take ¼ pound of soft soap, ¼ pound of whiting, 1 ounce of soda and a piece of "stone blue" the size of a walnut; rub it over the marble with a piece of flannel, and leave on for 24 hours. Then wash the marble with clean water,

and polish with a piece of flannel or an old piece of felt.

The following recipe for taking stains out of white marble may be of interest in this connection: Take 1 ounce of ox gall, 1 gill of lye and ½ teaspoonful of turpentine. Mix and make into a paste with pipe clay. Put some of the paste over the stain, allowing it to remain for several days. To remove oil stains apply good clay saturated with benzine. If the grease has remained



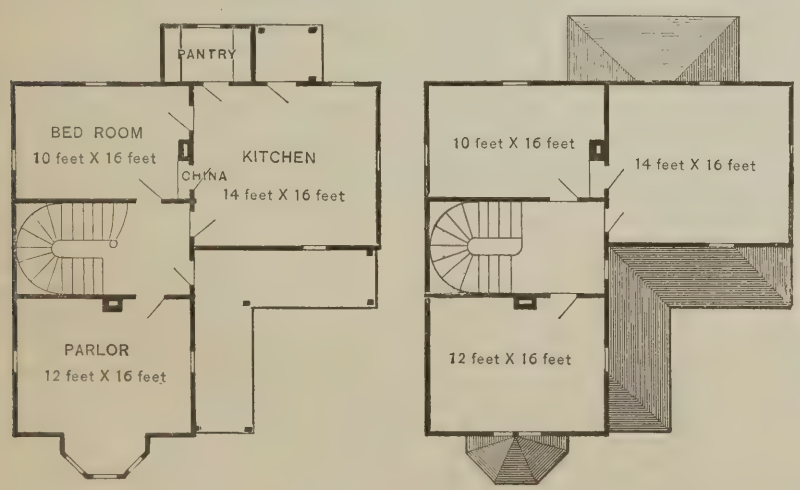
House Plans Submitted by J. E. Cowdry, Stanwood, Iowa.—Scale, $\frac{1}{16}$ Inch to the Foot.

in the marble long the polish will be injured by this treatment, but the stains will be removed.

Iron molds or ink spots may be taken out in the following manner: Take ½ ounce of butter of antimony and 1 ounce of oxalic acid. Dissolve them in 1 pint of rainwater. Add enough flour to bring the mixture to a proper consistency. Lay it evenly on the stained part with a brush, and after it has remained for a few days wash it off, repeating the process if the stains have not been fully removed.

Plans of Country Houses.

From J. E. Cowdry, *Stanwood, Iowa.*—I submit herewith two sets of plans for country houses which may be of interest to the readers of *Carpentry and Building* while the subject of farmhouses is under consideration. The plans speak for themselves in matter of arrangement and utilization of room, and a description accordingly is unnecessary.



House Plans Submitted by J. E. Cowdry, Stanwood, Iowa.—Scale, $\frac{1}{16}$ Inch to the Foot.

Elliptical Curves.

From C. S. J., *Alexandre, Manitoba.*—Please inform me if there is such a thing as striking one-half, one-third or seven-tenths of an ellipse, and, if so, how it can be done. I was at work on a building several years since in which there was a large arch, being some 30-foot span, which looked as though it were elliptical in outline. I asked the foreman about it and in reply he said, "It is seven-tenths of an ellipse."

Answer.—We do not know just what the foreman meant by the reply quoted, but it would seem to be at best an equivocal answer. All the rules of striking ellipses admit of the use of any portion of the curve that is produced. In other words, an ellipse being drawn, one-half, one-third or any other portion may be employed that is desired. When it comes to striking an elliptical arch of large dimensions, probably the best rule of producing it would be one that employs the intersection of lines rather than the use of an instrument or cord and pencil. A suggestion of the way the work may be done is as follows: First, mark out the curve to a small scale by any means most convenient and then enlarge it as circumstances may require, using such a rule for the production of the curve as will be most convenient to apply to the large work. Referring to the portions of an ellipse abovementioned, it would make a material difference where the dividing line occurred. If taken across the end of the ellipse the arch would be much higher in the center than if taken parallel to the long axis. On the other hand, if the line cutting the figure was parallel to neither the major nor minor axes, a very peculiar form would result. We think the answer quoted was a flippant one, and that the arch in question was probably a curve obtained by means most convenient to the workman employed, and that it was not a part of a true ellipse, although elliptical in appearance.

REFERRED TO OUR READERS.

Road Bridges.

From G. H. B., *Virden, Manitoba.*—I shall be glad to see in *Carpentry and Building* plans, specifications and estimates of cost of common road bridges. Such information would be valuable, I think, to a considerable class of your readers.

Grocery Store.

From S. D. L., *Ancosta, Ontario.*—If some reader of *Carpentry and Building* will furnish design of a grocery-store front suitable for a village, to be erected on a lot 28 feet wide, and to have the lower story about 12 feet high, he will confer a favor.

TRADE PUBLICATIONS.

Iron Specialties.

We have received from the Van Dorn Iron Works, Cleveland, Ohio, a collection of their catalogues showing the different specialties which they manufacture. One is devoted to wrought-iron fences and contains a large number of designs that cannot fail to be of value to all who have occasion to use such material. Another relates to crestings and terminals. This, while presenting many stock designs, also shows a considerable amount of new work. Over some of the new designs we notice a legend which cannot fail to meet approval in the mind of every reputable manufacturer. It is in the following words: "Honest competitors will not copy our designs, but will leave that to pirates." Another pamphlet is devoted to stable fittings and contains a varied assortment of goods in this line. Still another one contains designs of lawn vases, of which a large assortment is presented. Another is devoted to jail-work and shows various features of design and construction that are of interest to all who have to do with penal institutions, the designing of jails, &c. Still another book is devoted to area, stair and balcony railings, fire escapes, vault doors, &c., and is as complete in its features as the others already enumerated.

Foot-Power Machinery.

The W. F. & John Barnes Company, of Rockford, Ill, have sent us a copy of their new price list and descriptive catalogue of foot-power machinery. The pamphlet contains nearly 100 pages and presents numerous illustrations of the foot-power specialties manufactured by this company, as well as a large line of hand tools more or less useful in the wood-working trades. The first subject treated in the pamphlet is foot-power machinery for practical use in workshops. A description is presented of a complete outfit of foot-power machinery of this kind, which operates with a positive motion always in the right direction, with large economy of power and without dead centers. An illustrated description of the foot-power combination is presented, after which some of the special machines to which it is applied are shown. Among the illustrations are cuts of scroll-saws of different sizes and capacities, after which is shown a foot-power former, which is supplemented by illustrations of the knives with which it is fitted. The work that can be done upon this machine embraces sash rails and various small moldings, including flutes. Three pages are devoted to sectional views in perspective, showing the forms produced by the knives used upon this machine. The assortment is varied, and shows conclusively the utility of the device. The next machine presented is a combined scroll-saw and circular saw, following which is shown a boring attachment to be used upon this machine. Cutter-heads are also illustrated, for use upon a saw mandrel for a combined machine for cutting grooves, gains, dados, &c. A hand circular rip-saw is likewise shown, made in different sizes and of different capacities. An improved foot-power molding machine and hand tenoning machine, several foot-power lathes and foot-power grinding and polishing machines complete the assortment of tools of the general class we have been describing. The remainder of

the book is devoted to drills, miter-saws, parts of machines and numerous hand tools, in which a very interesting assortment of staples and specialties is shown. The catalogue is of great usefulness to all in the trade who have occasion to purchase or use any of the kinds of tools above mentioned. We understand that it is to be sent free to all applicants.

Guaranteed Roofing Plates.

Messrs. Merchant & Co., of Philadelphia, in issuing a circular to architects descriptive of their different plates for roofing purposes, have made use of a very striking, and withal quaint envelope. The circulars contained are printed on good paper, and are handsome specimens of typographical art. They are neatly tied together with a pink ribbon, and are done, so far as titles are concerned, in quaint old-style type. The envelope, which is worthy of special attention, measures 9 x 10 inches, and has the counterfeit of a red ribbon crossing it each way through the center, tied and sealed. The legend on the seal is "Merchant & Company, Philadelphia and New York. Guaranteed roofing plates." The address, while quaint and likely to command attention, is not put upon the envelope in a way to earn the undying esteem of Uncle Sam's postal clerks. It commences "For ye hande of ye moste worshyppefulle," after which occurs a blank for the name of the party to whom it is sent, following which is "Architect, in ye goodlie cittie of." The following blank is filled by pen with the location of the party addressed. After the street and number it reads "Atte ye sign of." After the State and county it reads, "Situate in ye pleasant province of." The following blank would be filled in by pen. Carrying out the quaintness of the entire conception the word "these" is printed in the lower right-hand corner of the envelope as indicating what is to be delivered into the hand of the party addressed. In order that this important parcel may not be unduly delayed, notwithstanding the time that would be consumed in deciphering the address, the following is printed for the benefit of the postal authorities in general: "Postmanne, ride haste, post haste, with speed; for thy lyffe, for thy lyffe, for thy lyffe." We do not know how many postmen have felt like taking the "lyffe" of the designer of this envelope on account of the character of the superscription, but we have no doubt they are numerous. As said at the outset, the envelope is striking, and its inclosures are readable, and those of our subscribers who have not received a copy will no doubt serve their own interests by applying for the same.

TRADE NOTES.

We visited the shops of the Scribner Roofing and Cornice Company, of St. Paul, Minn., a year ago, and at that time had no hesitation in pronouncing the establishment the most complete and among the best equipped in the country. While others occupy larger buildings, and one or two perhaps have a more varied assortment of machinery, a certain care displayed in the arrangement and management of the tools in use, and the general thoughtfulness with which the business was conducted, led us to believe that, all things considered, this establishment was the best prepared to handle work of any we had ever inspected. We have been recently informed that the company have made still further steps in advance. A number of their hand-power machines have been discarded and special steam-power machines substituted. We understand that new shop buildings are also in contemplation. When all these changes have been accomplished there will be no doubt that this company will be far ahead of their competitors. These facts are of special interest to the builders of the Northwest who depend upon St. Paul for their supplies.

Messrs. Curtis Brothers & Co., manufacturers of sash, doors, blinds, moldings, &c., of Clinton, Iowa, send us a lithographed poster of large size. The printing is done in a variety of colors, and the general effect is exceedingly striking. The illustrations represent the factory, lumber yard and office of the company at Clinton, Iowa, and the factory at Wausaw, Wis., and the sawmill at Rib Lake, Wis. The company was established in 1866, and incorporated in 1881.

A very beautiful altar railing has recently been completed by the Composite Iron Works, 83 Reade street, New York City. The railing in question was made for a church at Zacatacas, Mexico, and was designed by a native artist. The material out of which the rail is composed is real bronze, finished partly by gold-plating and partly by nickle-plating, and chased. It is in all respects a specimen of very fine metal work, the design being very difficult of interpretation and execution. The value of the work in question was about $5000.

The Bridgeport Wood Finishing Company, whose works were formerly in New York City, have recently removed to new and extensive buildings at New Milford, Conn. By this change their works are located near abundant mines of raw material of the best quality for their specialty, and they are provided with better facilities for manufacturing, storage and shipping than ever before. Their general office has also been removed from New York City to New Milford, Conn., and from May 1st all orders will be filled from that place. By this change consumers and dealers will be brought into more direct communication with the source of supply than formerly, with important advantages to all concerned. The company will continue to be represented in the city, their branch office being at 96 and 98 Maiden Lane.

One of the largest and most elaborate displays of grates, mantels, fenders and all the accessaries belonging to the trade, such as tile, fire irons, fire sets, &c., that has ever been made in this city is to be seen in the show-rooms of Messrs. J. S. Conover & Co., Nos. 28 and 30 West Twenty-third street. The display is not only large, but it is most artistically arranged, and will bear inspection from the most critical standpoint. The display is arranged in four separate departments, namely, mantels, fireplaces, grates and tile. The mantel department is in the form of a series of rooms sumptuously furnished, and arranged upon the idea of allowing a patron to see and know exactly how a room would appear fitted up as he might desire. One room, for example, is hung with maroon plush, and one of the mantels in the same is of highly polished cherry wood, selected especially for its beauty of grain and richness of color. The fireplace is of polished brass, elegant in design. The hearth is inlaid with tile and the general effect is very satisfactory. This very brief description is quite inadequate, for each of the several sides of the different rooms are different in design, no two rooms being similar in style or general treatment. The fireplace display is in another part of the building and contains probably the largest assortment ever got together in one show-room. The arrangement, color of drapery, color of carpets and management of light display the same good taste as is manifested in the other departments. The tile department is in the basement of the establishment, and here the visitor is as completely overwhelmed by the styles and varieties to select from as in the portions already described. Architects and builders as well as house owners visiting the city will be well repayed by spending an hour in the permanent show-rooms of this firm, which have been thus arranged for their special benefit.

Auld & Conger, of No. 100 Euclid avenue, Cleveland, well known to the trade as slate roofers and as manufacturers and shippers of slate, have recently issued a neat card, which, while primarily advertising their business, also contains information that is useful to all engaged in the roofing trade. On the front of the card the style and address of the firm are given, and in two of the corners a cut of their office in Cleveland and a view of a slate quarry in Vermont. In the other corners there is shown the operation of laying slate upon a roof, and also a general view of the slate-dressing machine of which this firm make a specialty. The color work on the card, which is very attractive in appearance, represents sections of roof, displaying some of the patterns of cut slate produced by the machine above mentioned. The diagrams not only illustrate the patterns, but also the combinations of colors, that are possible. The reverse of the card contains a table showing the number of slate required to lay any number of squares of roof up to 70, and also the quantity of nails to a square. Other data of importance to builders and roofers are also presented.

John Grossius, 389 Main street, Cincinnati has issued in neat form a circular addressed to architects and builders and all who need heating fixtures, describing his furnace and also his laundry-drying closet. The circular is printed on imitation linen in two colors, and is a very handsome specimen of typographical art. A list of names of those using Mr. Grossius's fixtures is appended, including a number of well-known gentlemen in Cincinnati and vicinity. The circular is of a kind that cannot fail to command attention, and the illustrations presented are large and well drawn.

Apropos of the recent organization of the National Slate Exchange, Boyle & Co., of 419 Walnut street, Philadelphia, announce to the trade at large that they are members of the exchange, and that one of their firm will always attend the exchange meetings. They propose to act as brokers, and will buy and sell as may be the orders of their patrons. They have issued several very neat circulars relating to the slate business, directing attention to the value of slate as a roofing material, as well as for other purposes, and showing the economy of its employment.

A very handsome illustrated catalogue of grates and open fireplaces has recently been issued by Thomas S. Dixon & Sons, 1330 Chestnut street, Philadelphia, proprietors of the Philadelphia Grate Works. The catalogue contains over 60 pages, and each page is illustrated with a finely-executed cut of a grate or fireplace, showing the large variety of styles manufactured by them. The illustrations show a number of very tasteful designs, which the high quality of the engravings brings out very strikingly. At the end of the pamphlet are given a few illustrations of summer fronts. In connection with this catalogue is printed a separate and smaller pamphlet containing price lists of all the different grates and fireplaces illustrated, the reference being made by the numbers of the plates. The first illustration in the larger pamphlet is a section of a chimney showing the position of Dixon's low-down grate, when set, the arrangement controlling the draft and the method of removing the ashes.

The Narragansett Machine Company, Providence, R. I., are directing attention to their foot-power circular saw, which, they assert, is found very useful to contractors in building the present style of houses, since it may be taken to the building and there used for various purposes. Among other things it is serviceable for cutting and pointing shingles to exact widths or forms, getting out modillions, dentils and the like. The construction is such that the saw may be raised and lowered without moving the table. The foot-power by which it is operated has no dead centers, and is always ready to start when the foot presses the treadle, and always starts in the right direction.

R. T. White, No. 40 Oliver street, Boston, Mass., the inventor and manufacturer of the "Universal" wood-worker, informs us that he started one of his No. 1 machines in the new capitol at Albany some time since, doing upon it mortising, variety molding, inside-panel molding and raised panel-work, to the entire satisfaction of the commissioners and superintendent of the building. Among recent shipments which Mr. White has made he mentions sending a No. 2 machine to Cleveland, Ohio; a No. 1 to Chicago, and also one of the latter size to Grand Rapids, Mich.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

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Frame Dwelling-House.

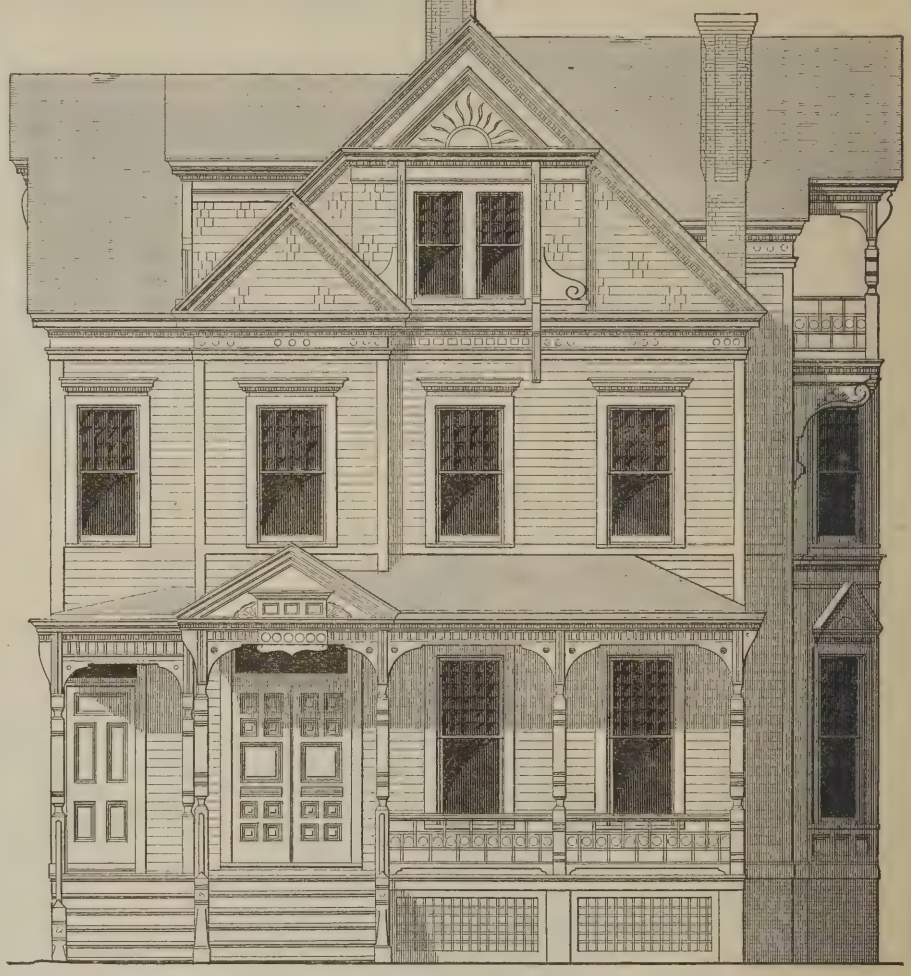
Contrary to the precedents somewhat established by the course of this journal in the past, we present this month a perspective view, together with the elevations and details, of a house actually constructed, instead of a house about to be built or a design prepared to meet an imaginary want. The dwelling shown is one recently erected on the east side of Palisade Avenue, West Hoboken, N. J., for Mr. A. Wiggers. The designs were prepared by Messrs. La Baw & Son, architects, Jersey City, N. J. The perspective view shown on this page was engraved by a direct process from a photograph of the building taken just after its completion. Unlike most of the perspective views which we have shown in the past, this cut has been prepared without the intervention of a line drawing. It shows the house as it stands with all the fidelity of a photograph, and accordingly must be more satisfactory to the reader than a cut as ordinarily prepared. The elevations, plans and details on the succeeding pages show the general character of the work, and are in the usual satisfactory shape of working drawings presented in this journal for use by builders and architects who notice any features about them that are desirable. The view in the front hall showing the newel post and balusters, on page 106, was also made from a photograph, and shows the work as it actually exists. It is not an imaginary view such as is frequently prepared in similar cases. The building in question, like many others located in the same general neighborhood, occupies a commanding site. The rear portions of the house overlook the North River, with New York City in the distance. The background shown above the fence at the right in the engraving indicates the general direction of the city. The view in the day-time, especially with the aid of a glass, is very interesting, while at night the myriad lights of the great city, together with the moving lights of various colors on the river, form a spectacle almost fairylike in its enchantment. However, it is with reference to constructive features and matters of plan and design, rather than location and general surroundings, that our readers are more interested.

DWELLING ON PALISADE AVENUE, WEST HOBOKEN, N. J.—La BAW & SON, JERSEY CITY, ARCHITECTS.

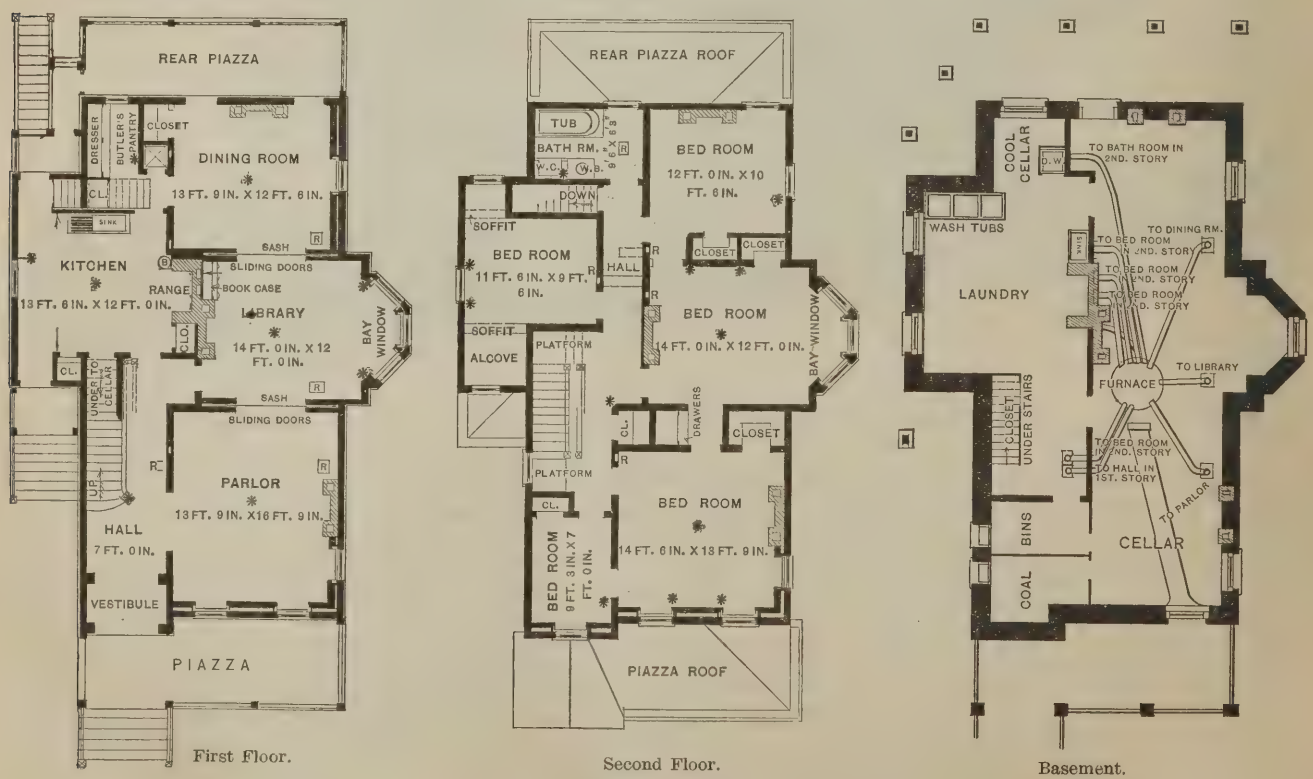
From the architects' specifications we gain the following general particulars. The general frame of the building was sheeted all around before the weather boarding was put in place. Over the sheeting and roof boards a layer of "Eureka" sheeting paper was placed. Hemlock boards were used for the rough sheeting, and the clapboarding employed was 5 inches wide, ¼ inch thick at one edge, and ½ inch thick at the other. It is laid so as to show 4 inches to the weather. The roof is of slate, there being used for the purpose Chapman black slate, 6 x 12 inches in size, laid 4 inches to the weather. The flashings about the chimneys, also gutters and valleys, are of tin. The shingle-work shown in the gables is done with California shingle, 5 x 18 inches in size, laid 4 inches to the weather. The floors are of pine, that in the kitchen being of Georgia pine and those in the other rooms of white pine. The partitions are constructed with 2½ x 4 inch studs, placed 16 inches from centers. The ceiling beams on the first and second stories are cross-furred before lathing. The general construction of the piazzas will be readily gained from the details presented herewith. The inside trimming of the house may be described as very plain. We have omitted the details of it. The architraves are made 6 inches wide on the lower floor and 5 inches wide on the chamber floor. Reeded mouldings with square corners and very slight projection are the leading features. The base in the first and second stories is of a character to correspond with the architrave already described. It is 8½ inches on the lower floor and 7 inches on the upper floors. The windows throughout are provided with inside shutters and blinds. Careful attention has been paid to details of convenience, such as shelving in closets, etc. The plastering of the house is three-coat work throughout. Cornices are run on the ceiling in the upper rooms in both first and second stories. Centers are located in the upper room, as indicated by the stars in the floor plans. The

mantels are of slate, and in design are appropriate to the general appointments of the rooms in which they are located. A brick-set range is provided in the kitchen. The house is heated by a furnace, the location of which, together with its supply of fresh air and the arrangement of the pipes, is clearly shown in the basement plan. The front vestibule has a floor laid of tile.

On examination of the floor plans of this building it will be seen that the arrangement is different in character from that ordinarily encountered in detached dwellings, whether built near the city or in suburban districts. The kitchen, instead of being placed in the extreme rear of the building, occupies a central position. A door facing the street opens into it direct from a piazza provided for the purpose. By this location of the kitchen the space under the front stairs is utilized for reaching the cellar. The parlor occupies the front of the house, while the library or sitting-room, or back parlor, as it would be in some cases called, is in a central position and is lighted by the bay window provided at the side. By this means it commands a front, as well as side and rear views. The dining-room occupies the rear portion of the lower floor, and its windows, owing to the peculiar location of the house, command a view of the lower portion of New York City and the harbor. The rear piazza, as will be seen by the side elevation, is inclosed for use as a conservatory. There are less novelties in the arrangement of this house in the second floor than in the lower floor. Four bedrooms are provided on the second floor, besides a commodious bathroom. The attic floor, of which a plan is shown on page 103, provides two bedrooms and shows an unfinished space which could be utilized for various purposes if circumstances required. The basement of the house provides a commodious laundry, with coal bins for both kitchen and furnace use, as well as the furnace room already referred to. Unusual care has been employed in the design and construction of this house to adapt it to the wants of the owner and in the highest degree to its peculiar location.



Frame Dwelling.—Front Elevation.—Scale, ⅛ Inch to the Foot.

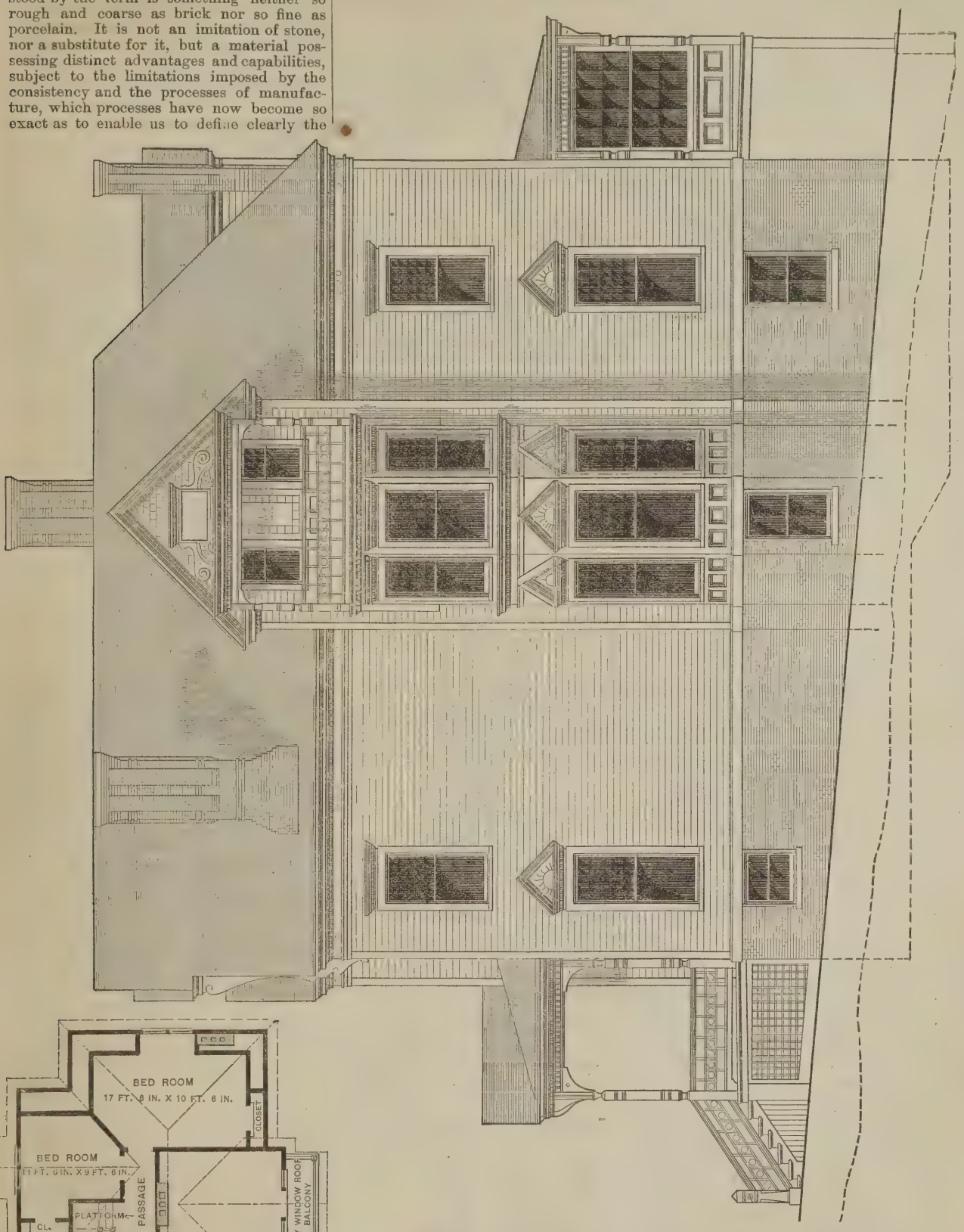


Floor Plans.—Scale, $\frac{1}{16}$ Inch to the Foot.

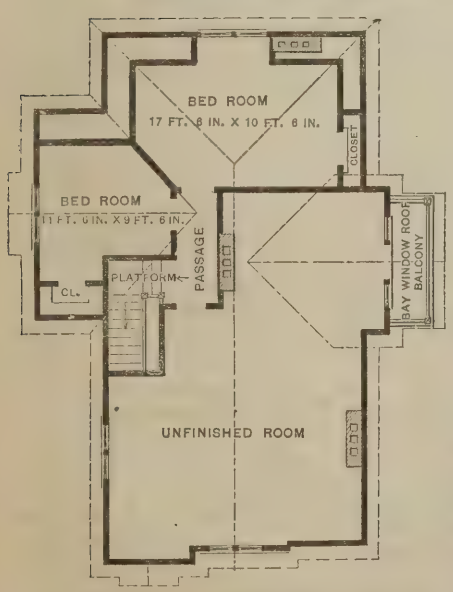
Terra-Cotta.

The popular knowledge of terra-cotta in America, says a writer in *Harper's*, may be said to consist in greater or less familiarity with such small objects as the statuettes made in Italy and in Spain illustrative of the types and costumes of the people, and in some general information concerning the relics of various ages in the museums and churches of Europe; but the capabilities of terra-cotta as a material for practical and artistic uses are little appreciated. It is our purpose to show not so much what has been done in terra-cotta as what still remains to be done, and how we can learn from the best examples to avail ourselves of the advantages the material offers, especially in certain classes of art work. The manufacture of terra-cotta has been carried on in some form from the earliest civilization of which we have any record; in fact, much of our knowledge of ancient history has been derived from terra-cotta tablets, whose impervious surfaces have retained the original inscriptions for thousands of years, under conditions that have caused stone to crumble away and have corroded metal until all trace of its having been fashioned by human hands has disappeared.

Terra-cotta would literally include everything made of "cocked earth," from brick to china and porcelain, but what is now understood by the term is something neither so rough and coarse as brick nor so fine as porcelain. It is not an imitation of stone, nor a substitute for it, but a material possessing distinct advantages and capabilities, subject to the limitations imposed by the consistency and the processes of manufacture, which processes have now become so exact as to enable us to define clearly the



Side Elevation, Showing Original and Present Grade of Lot and Foundation Line.—Scale, ⅛ Inch to the Foot.



Attic Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

advantages and disadvantages of terra-cotta as compared with other materials in any particular undertaking. As an understanding of the nature of any material is the first requisite for its proper treatment in design, we shall briefly describe the various stages of manufacture, from the selection of the clay to its final crystallization in a work of art. The clay selected for terra-cotta is that composed of silicate of alumina and a small percentage of iron, oxides of iron, as in bricks, producing a red color when fired. The clay is stacked in sheds until it is dry; it is then ground to fine powder and mixed with powdered old terra-cotta or with ground flint, granite sand or other vitrifiable substances. The mixture is then ground with a certain small proportion of water, to obtain a perfectly homogeneous, ductile modeling clay, free from the smallest air cavities. The proportion of water determines the shrinkage that must occur in burning, and this shrinkage can be relied upon as one-twelfth.

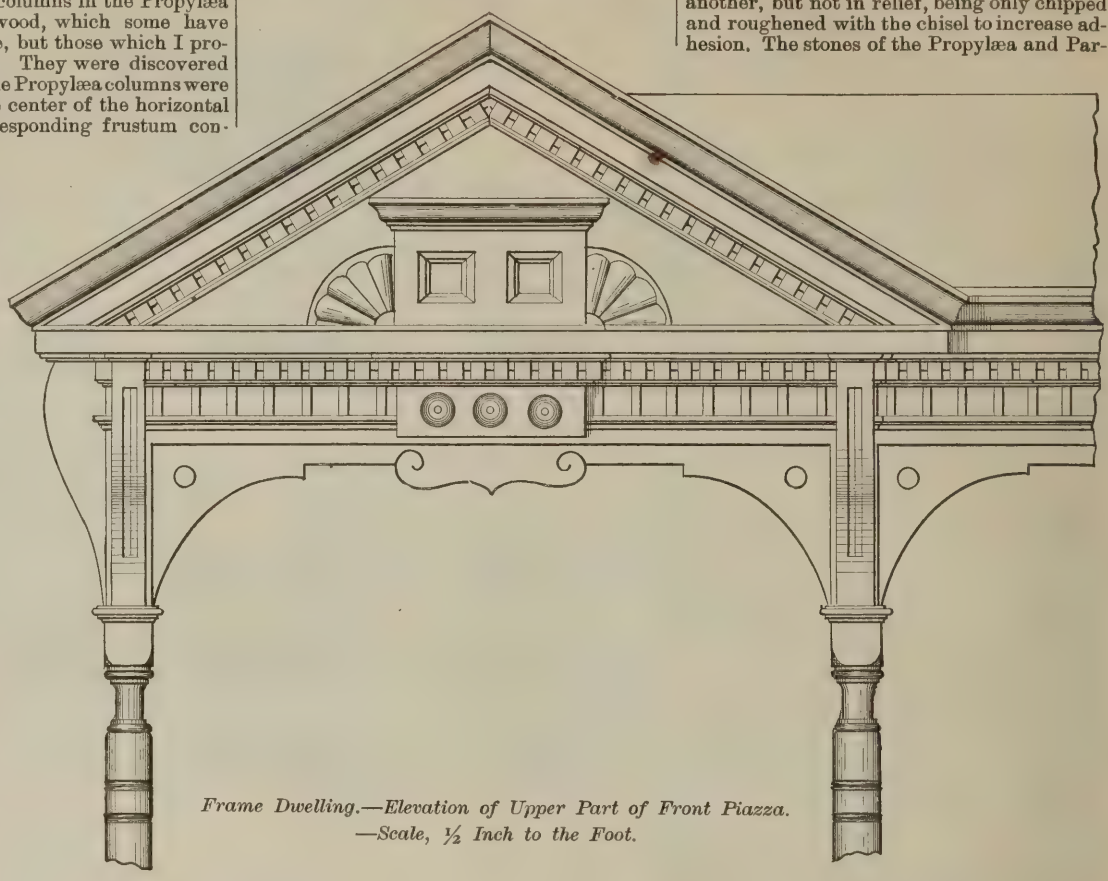
All objects, whether mere cubes or statues, must be hollow, and as nearly as possible of the same thickness throughout, as a solid object invariably becomes distorted in burning, owing to the interior being more slowly baked than the exposed portions. The darker the color required the harder the firing must be, often reaching a white heat, or more than 1100° F. It has not always been possible to attain perfect uniformity of color in a number of pieces of terra-cotta, even when the pieces have been made of the same mixture and burned at the same time; but this fact is rarely a serious objection. On the contrary, in many instances some variation in tone in a monotonous reduplication of form is agreeably effective.

Engineering in China has achieved a notable triumph in the bridge at Lagang, over an arm of the China Sea. This structure is 5 miles long, built entirely of stone, has 300 arches 70 feet high, the roadway is 70 feet wide, and the pillars are 75 feet apart.

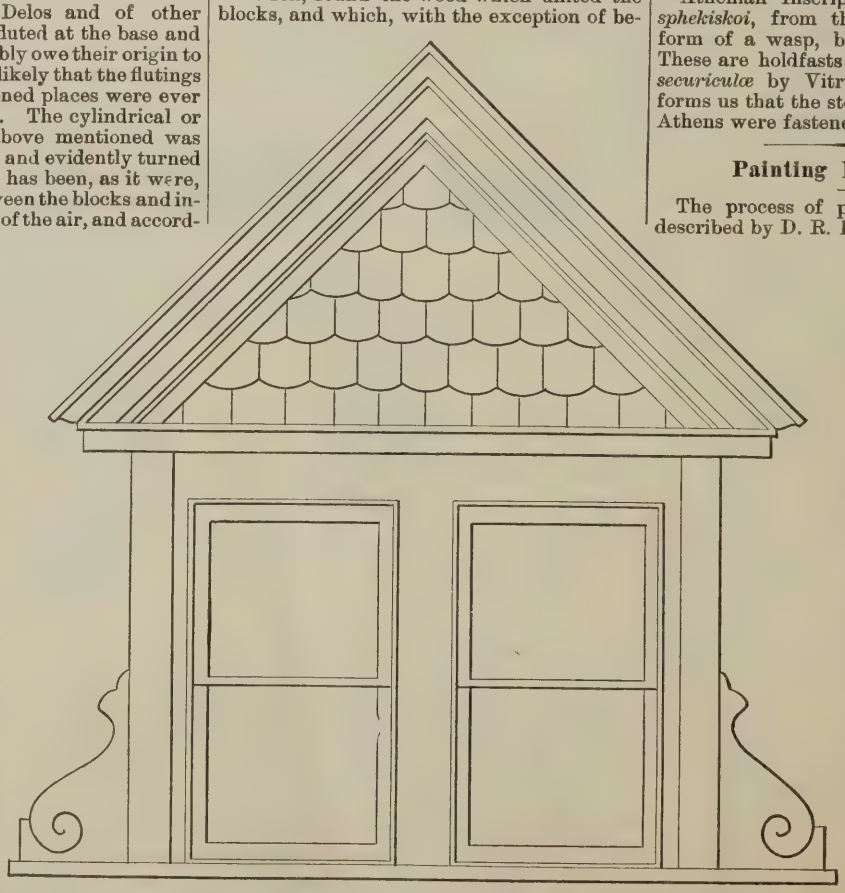
Wood Dowels in Greek Masonry.

Mr. Edward Dodwell, writing on this subject, says:

The frusta of the columns in the Propylæa were united with wood, which some have imagined to be olive, but those which I procured were of cedar. They were discovered when the blocks of the Propylæa columns were thrown down. The center of the horizontal surface of each corresponding frustum contains a hole or mortise, 4 inches square and 3¼ in depth; each hole is filled with a piece of squared wood, fitted exactly into the two contiguous mortises. The center of this square piece is perforated for the purpose of receiving another piece of a cylindrical form, acting as a *gomphosis*. This was probably not designed to give any additional strength to the union of the blocks, but to serve as a centering on which to turn the upper block, in order to insure a coincidence of the flutings, for it seems likely that the flutings were begun, or roughly sketched, before the masses of the columns were placed upon each other, and that they were finished afterward. The columns of the temple of Apollo Didymæos, in Asia Minor, have been left in a very unfinished state, and the flutings are more or less imperfect. The columns of Eleusis, Thorikos and Delos and of other places, which are only fluted at the base and under the capital, probably owe their origin to that cause; but it is not likely that the flutings at the three last-mentioned places were ever intended to be finished. The cylindrical or inner piece of wood above mentioned was worked extremely true, and evidently turned by means of a lathe. It has been, as it were, hermetically closed between the blocks and inaccessible to the contact of the air, and accordingly preserved without the smallest injury; the two outer bits were painted red; some of the color was visible when first found, and the remains of it may still be seen. The columns of the Parthenon and of other Grecian temples are no doubt united in the same manner, for the blocks that have fallen down have the square hole in the surface for the reception of the wood, similar to those of the Propylæa. Wood was made use of to unite stones in the earliest times. The 11th verse of the second chapter of Habakkuk is applicable to the proverbial strength of such a union: "For the stone shall cry out of the wall, and the timber that is between the joints of the building shall answer it." Flaminio Vacca, in his "Memoirs," says that the stones of the forum of Nerva, at Rome, were united with wood. But these instances probably relate to the dovetail or *imantosis*, and not to the pieces of wood in the columns above mentioned, which do not act on the principle of the dovetail. Le Roy says that the columns of the Doric edifice at Thorikos were united by a hard, red wood in the same manner as those of the Propylæa; and the late M. Dufourny, of the French Institute, who was at Agrigentum when a column of the temple of Juno fell, found the wood which united the blocks, and which, with the exception of being rather smaller, was perfectly similar to those of Athens. The frusta of the columns at Baalbec were united with large and long iron pins centered in square pieces of the same metal. Round the hole, in the surface of the blocks at the Propylæa, is a circular ring elevated about ½ inch above the rest of the surface, which fits into a cavity in the corresponding block. Round this ring is another, but not in relief, being only chipped and roughened with the chisel to increase adhesion. The stones of the Propylæa and Parthenon walls are united with iron and lead. Metal cramps were generally termed *gomphoi* or *chalkeo-gomphoi*. But in Chandler's "Athenian Inscriptions" they are called *sphekiskoi*, from their resemblance to the form of a wasp, being thin in the middle. These are holdfasts or double tenons, called *securiculæ* by Vitruvius. Thucydides informs us that the stones of the long walls of Athens were fastened with iron and lead.



Frame Dwelling.—Elevation of Upper Part of Front Piazza. —Scale, ½ Inch to the Foot.



Elevation of Dormer Window on Side.—Scale, ½ Inch to the Foot.

Painting Plaster Work.

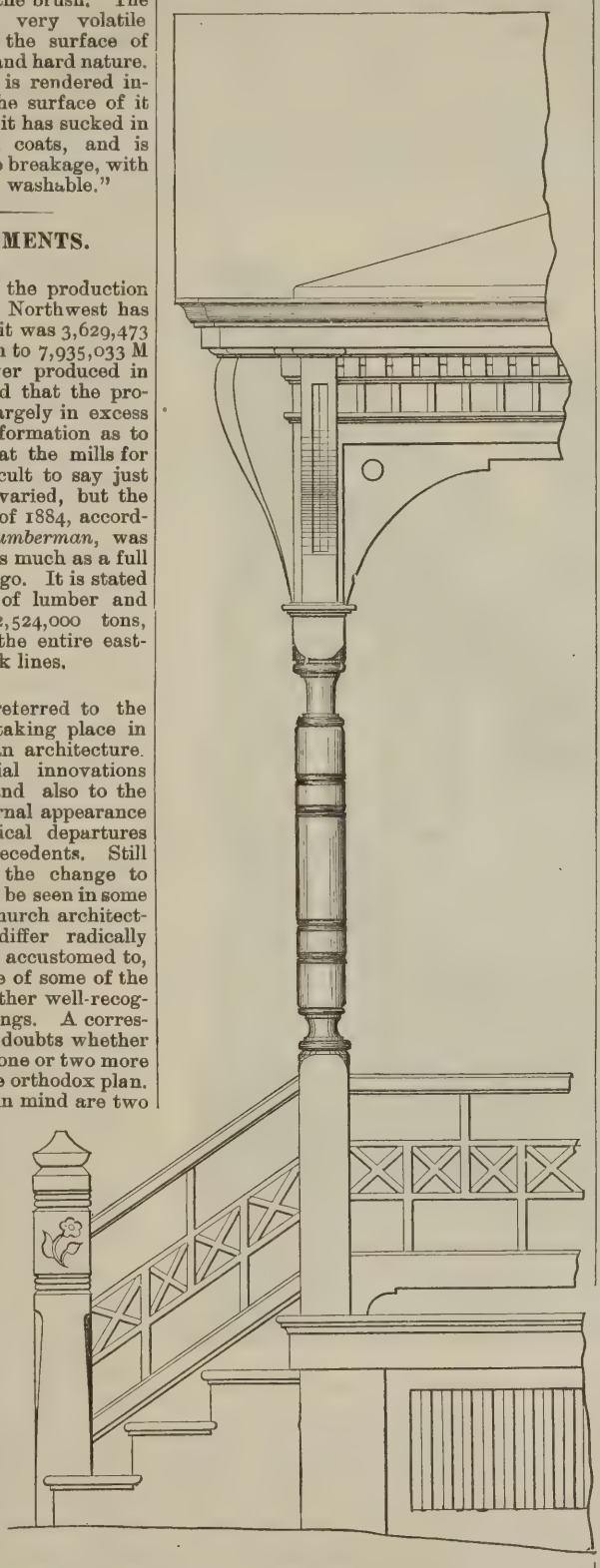
The process of painting plaster work is described by D. R. Hay as follows: "White lead and linseed oil, with a little litharge to facilitate the drying, are mixed together to about the consistency of thin cream; a coating of this being applied, the oil from it is sucked into the plaster in the course of a few hours, leaving the white lead apparently dry upon the surface. In the course of a day or two, when this coat has sufficiently hardened, another is given a few degrees thicker, the oil from which is partially absorbed, according to the nature of the plaster. In the course of a few days more a third coat is applied. This coat is made pretty thick, and if the absorption of the oil from the second coat has not been great, about one-fourth of spirits of turpentine is added; but where the absorption has been great, a less proportion of spirits of turpentine is employed. Into this coat is put the coloring ingredients, to bring it near the shade intended for the finishing coat. Should the plaster now be thoroughly saturated, the flatting or finishing

coat is applied. Before this is done, however, a fourth coat, thinned with equal portions of oil and spirits of turpentine is generally given, particularly where the work is wished to be of the most durable kind. The flatting or finishing coat is composed entirely of paint—that is, of white lead and the coloring ingredients mixed together and ground in oil to an impalpable paste. This mixture is of a very thick consistency, and must be thinned with spirits of turpentine until it will flow easily from the brush. The spirits of turpentine being very volatile evaporate entirely, leaving the surface of the paint of a very compact and hard nature. By this process the plaster is rendered incapable of absorption, and the surface of it is hardened by the oil which it has sucked in from the first and second coats, and is thereby rendered less liable to breakage, with the great advantage of being washable."

NOTES AND COMMENTS.

Within the past six years the production of white-pine lumber in the Northwest has more than doubled. In 1878 it was 3,629,473 M feet, and in 1884 had risen to 7,935,033 M feet, the largest quantity ever produced in a year. But it is to be added that the production last year was very largely in excess of consumption. Lack of information as to the exact stocks on hand at the mills for previous years makes it difficult to say just how the consumption has varied, but the stock on hand at the close of 1884, according to the *Northwestern Lumberman*, was 3,516,957 M feet, or nearly as much as a full year's production six years ago. It is stated that last year's production of lumber and shingles weighed about 12,524,000 tons, which is a third more than the entire eastbound movement of the trunk lines.

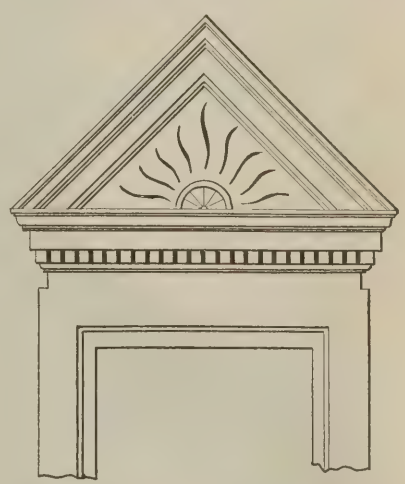
We have before now referred to the changes that are gradually taking place in American city and suburban architecture. We have referred to material innovations in the way of planning, and also to the striking changes in the external appearance of many buildings and radical departures from old and established precedents. Still other examples illustrating the change to which we have referred may be seen in some of the recent specimens of church architecture in this city. These differ radically from the types we have been accustomed to, being designed after the style of some of the old Flemish town halls and other well-recognized types of secular buildings. A correspondent asserts that he has doubts whether there will be seen more than one or two more great churches finished on the orthodox plan. The exceptions that he has in mind are two Catholic churches, one of them being the famous cathedral of this city, the spires of which have not yet been built, and the other belonging to the Paulist Brothers, and situated near Central Park. We think that perhaps there will be other exceptions to the general rule he lays down. But it must be admitted that a marked change is taking place in the character of church architecture in this city. The future will perhaps indicate more radical departures from styles which have become inseparably associated in the minds of some people with church architecture than ever before. The same correspondent alludes to the flimsy construction peculiar to the present day, which has invaded church work almost as much as other buildings. The cathedral above referred to is a very fine-looking building, but the roof is an architectural fraud. Instead of being made of stone ribs and groins that it counterfeits, it is made of wood, painted and sanded to carry out the deceit. A French builder, and one who is thoroughly conversant with good features of construction, remarked concerning this work a short time since: "It is too bad! Now, I suppose it will never be replaced in stone, for, in your country, when they adopt a convenience it soon becomes a permanence."



Frame Dwelling.—Side Elevation of Front Piazza.—Scale, ½ Inch to the Foot.

Professor Ayrton, in writing upon the apprentice system, says: "There must be some plan by which a man learns the manipulation of his trade; he must learn a good deal in the workshop which he cannot get at a school of applied science or in a technical school. I think possibly something like the present apprenticeship system should exist, but for a shorter number of years. The master at the present time gains by the apprenticeship system—the rise of pay that occurs the day that an apprentice ceases to be an apprentice shows the benefit the master has been deriving from the apprenticeship system. On the other hand, he has not been doing his duty all the time to the apprentice; he has not been giving him the instruction he ought to have been giving him. The conditions of trade prevent him doing it individually, and, therefore, as it is impossible for him to follow the old custom of giving personal instruction, he ought to help to provide the funds for technical colleges. I am inclined to think a considerable amount of good technical instruction could be given if a kind of technical school were attached to the large factories, such as there are in Sheffield and other places, the funds being provided by the masters. In this technical school attached to the factories the workmen who might be compelled to come would not learn the manipulation of their trade, but the application of science t their trade. The instructor would be receiving a salary from the masters of the works, and he would show workmen the practical application of scientific principles by taking the workmen about the works and explaining things in the work themselves."

We have before now referred to the habit of posting bids after a letting for the benefit of competitors and as an evidence of good faith upon the part of those who have charge of the letting. This practice, where it is consistently lived up to, meets general approval upon the part of bidders, and many advantageous results can be traced directly to it. Discrepancies in bids are less frequent, and the educational influence of a comparison of figures is not to be lost sight of. In many cases where figures are suppressed upon the part of architects or those who have charge of lettings, and information concerning the figures submitted is refused after the letting, it very generally follows that motives are impeached. Secrecy of this kind is taken to indicate lack of honesty or the evidence of trickery, and accordingly grumbling and dissatisfaction are the order of the day. Architects frequently arrogate to themselves the right to do as they please in matters of this kind, and refuse to be questioned. This position would be an excellent one were they in all cases above suspicion, but, unfortunately for the profession, their high office has been so frequently prostituted that many contractors and builders have no longer unquestioning confidence in them.



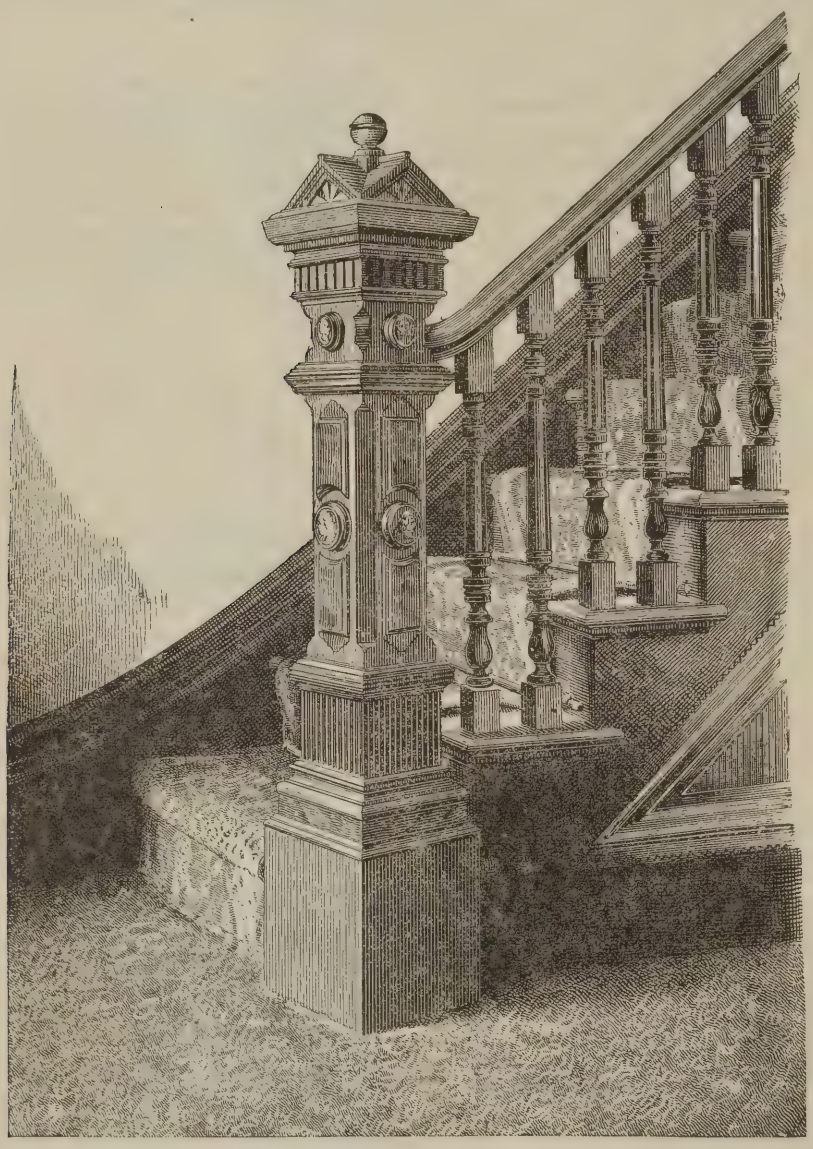
Window Heads in First Story.—Scale, ½ Inch to the Foot.

Two notable circumstances relating to matters of this kind have recently occurred. The builders and contractors in Chicago, it is reported, have taken the ground of opposing the posting of bids. This is contrary to general precedent and can be explained only by the fact that there is some special reason for it. Either it is done to weed out a certain class of irresponsible bidders who are making capital out of the custom of publishing bids after the lettings, or for some other equally good reason. We cannot for a moment believe that it is done on the merits of the case or out of a disinterested consideration for the architects, who have long been in favor of that plan. On the other hand, the Central Association of Master Builders of London has passed a resolution asking the

Government to permit builders making proposals on public works to see the list of the bids after the decision is made. Our own Government is already following this practice, and it gives general satisfaction. It would seem that Chicago and London were changing positions. It is odd, indeed, for the latter to appear less conservative than the former.

According to Captain Fowke, the French method of scaffolding differs in many respects from that used in Great Britain and also in this country. It is entirely of squared timber, and put together with bolts and nuts, and, instead of ladders, regular stairs are constructed in different parts of the scaffold itself. Ready means of ascent and descent are points of more importance in France, from the fact of the substitution, in a great degree, of manual labor for mechanical in raising material to the work. To such an extent is this carried that, in the construction of a wall 50 feet in hight, which was erected at the request of the British Commission, the stones of which it was composed were handed up from man to man by men placed on a ladder and along part of the scaffold, and 20 were constantly so employed.

Considerable attention has been given during a year or two past to high houses. Tall apartment houses are condemned by sanitarians on various grounds. They prevent the free admission of air and sunlight to the street and adjacent houses. For example, when a street is 60 feet wide, a building 155 feet high will cast a shadow of 110 feet on the opposite side when the sun is 30° above the horizon; a building 142 feet high casts a shadow of 98 feet, and a building of 128 feet in hight one of 84 feet. From this it is argued that buildings should be restricted to less hight than above named in order not to interfere with the general health of the community. Ordinary city residences do not exceed 60 feet in hight; accordingly, when one of these very high buildings is erected, it cuts off light and air from much of the surrounding property. The street often remains in shadow during a great part of the day, and, as a consequence, is both dark and damp. There are still other annoyances caused by high buildings. The chimneys in adjacent houses frequently refuse to draw unless they are run up to a great hight. Vertical ventilating shafts and flues likewise fail to perform their proper functions. Those who live in high houses are also exposed to serious danger from a sanitary point of view. The very weight of the materials entering into such buildings causes them to settle to a greater or less extent, thus frequently disarranging plumbing fixtures and other features of construction. Those occupying the lower floors must content themselves with a small proportion of the health-giving sunshine which their bodies and minds equally require. Those who dwell anywhere between the fourth and thirteenth floors must take the risk of having foul air and the germs of disease conveyed into their bedrooms and bathrooms by means of the lines of piping wells. The dangers from fire in houses of this kind, since their upper stories are practically beyond the control of the firemen with the present resources of water supply, should not be overlooked. A building 75 feet high in the residence districts of this city can barely be protected in case of fire. Apartment houses from 100 to 180 feet high are not only in themselves exposed to great danger in case of fire, but with their overhanging walls they imperil surrounding property. The above briefly presents the arguments used in favor of limiting by law the hight of apartment houses in New York City.



Frame Dwelling.—View in Front Hall, Showing Foot of Stairs, Newel, and Balusters.

Many circumstances tending to prove the truth of the old adage that "necessity is the mother of invention" might be narrated. One of the most recent of these to which our attention has been called appears in some of our English contemporaries. During the Franco-German war some German manufacturers, who had been supplied from Paris with veneers colored throughout the mass, finding their supply stopped, endeavored themselves to produce them. Experiments in this direction gave, in the beginning, colors fixed only on the outside, while the inside was untouched until the veneers were soaked for 24 hours in a solution of caustic soda containing 10 per cent. of soda, and boiled therein for half an hour. After washing them with sufficient water to remove the alkali, they were dyed throughout their mass. This treatment with soda effected a general disintegration of the wood, whereby it became in the moist state elastic and leather-like, and ready to absorb the color. It was then, after dyeing, dried between sheets of paper and subjected to pressure, to retain its shape. Veneers treated in this way, and left for 24 hours in a decoction of logwood (1 part of logwood to 3 of decoction), removing them after the lapse of that time, and, after drying them superficially, putting them into a hot solution of copperas (1 part of copperas to 30 of water), will, after 24 hours, become beautifully and perfectly dyed black. A solution of 1 part of picric acid in 60 of water, with the addition of so much ammonia as to become perceptible to the nose, dyes the veneers yellow, which color is not in the least affected by subsequent varnishing. Coraline dissolved in hot water, to which a little caustic soda and one-fifth of its volume of soluble glass has been added, produces rose colors of different shades, dependent on the amount of coraline taken. The only color which veneers will take up without previous treatment of soda is silver gray, produced by soaking them for a day in a solution of copperas—1 of copperas to 100 of water.

NEW PUBLICATIONS.

STANDARD PRACTICAL PLUMBING. Vol. I. By P. J. Davies. Size 8 x 10 inches, 362 pages. Published by E. & F. N. Spon. Price, $2.

This book is in part a republication of articles that had previously appeared in several of the English building and sanitary papers. These articles have been rewritten and supplemented by a large amount of new matter, for the purpose of making the completed work an encyclopedia of plumbing. An interesting chapter in the work is a series of examination questions suitable for plumbing schools and similar institutions. The object of the work, as the author states, is to supply a set of thoroughly practical instructions and a book of reference suitable for the workman, that may be safely used as a guide in any plumbing job, however intricate. Every subject connected with the plumbing trade is treated in a clear and concise manner. The vast number of illustrations, some 2000 in all, showing various articles and the methods of working, also add largely to the value of the work for the practical reader. A few pages at the end of the book are devoted to lead light and stained-glass glazing, which, though strictly speaking, is a subject not included in the category of plumbing, will prove of general value and interest. It must be always borne in mind, however, when reading or referring to this book, that it is the work of an Englishman, and that the practice described is consequently English, in many cases so materially different from the methods employed in America. Notwithstanding this limitation to the practical value of the work in this country, it cannot fail to interest as well as instruct the reader. The literature of practical plumbing, both here and abroad,

is so small that the present work cannot fail to have a large circulation, particularly as there exists no similar book embodying the practice of American plumbers. The general arrangement of the book is in every way excellent, and we look forward with much interest to the next volume.

How to Drain a House. Practical Information for Householders. By George E. Waring, Jr.; 222 pages, size 5 x 7 inches, illustrated, bound in cloth. Published by Henry Holt & Co. Price $1.25.

The general scope of this work is very clearly indicated by its title. It has been prepared for the information of householders, and appeals to architects and the owners of buildings rather than to plumbers and mechanics. It discusses almost all the phases of sanitary plumbing, and contains some account of the various fixtures that may be used in a house. It approaches the subject from the view of an individual householder, and the key to the author's object is afforded by a single sentence which occurs in the introductory chapter: "The drainage system is evidently a trustworthy ally only so long as the woman of the house holds it under careful supervision." The author enlarges upon this idea and enforces his advice in a very practical manner. Certain special fixtures are advocated, among which may be mentioned Putnam's trap and the "Dececo" water-closet. The author's well-known bias in certain directions is clearly indicated, but the book is practical and earnest from beginning to end.

Watch and Clock Making. By David Glasgow. Size 4¼ x 7 inches, 34 pages. Published by Cassell & Co. Price, $2.

In view of the scant literature on the subject, Mr. Glasgow's work will prove a most welcome source of information and may, as he states, be of service in assisting the rising generation of watchmakers to overcome many difficulties which have proved stumbling blocks to others. The volume is intended not only as a text-book for technical classes, but is designed also as a book of reference for the practical workman. The progress of the watch and clock trade is traced down to the present time and the gradual steps are pointed out by which improvements have been effected. Theoretical and practical treatment of the subject has further been so combined as to prove both interesting and instructive.

Portfolio of Japanese Sketches; 24 plates and frontispiece 12 x 16 inches, drawn by J. Thomas. Published by J. O'Kane. Price, $3.

This collection of sketches is very satisfactorily described by the title above. There is no descriptive text, and the sketches are miscellaneous in character, consisting of flowers, birds and groups of persons in both serious and comic moods. Although drawn by other than a Japanese artist, they contain much of the peculiar spirit always to be noticed in Japanese art work. The plates may be considered a very faithful reproduction of Japanese art studies. Some of the plates illustrating birds are very fine, and the same remark may be made of the leaf and flower studies. The work is a desirable addition to the libraries of artists and decorators.

Hait's Plant Studies. In two volumes. Vol. 1, 25 lithographic plates 15 x 11 inches, with 36 pages of descriptive texts, illustrated by woodcuts. Published by J. O'Kane. Price $5.

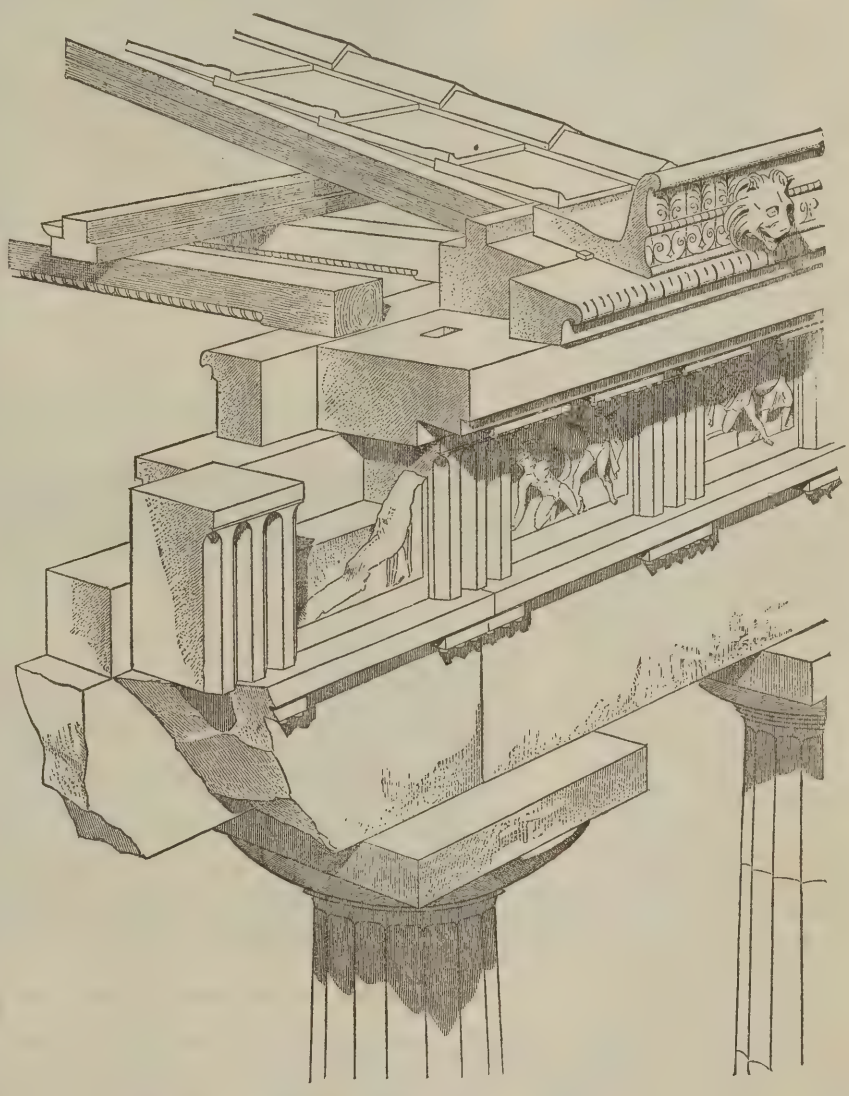
The appearance of a portion of the plates included in this work in one of the English furniture trade journals some time since created much interest on this side of the water upon the part of those who had the opportunity of examining and studying them. Mr. Hait has the happy faculty of taking up ordinary flower subjects and investing them with an interest scarcely equaled by the most enthusiastic descriptions of unusual forms. In the work before us such simple topics as the pea, apple, sunflower, blackberry, canterbury bell, chrysanthemum and other similar well-known forms are analytically considered in a way to be of great service to the art student, the decorator and the professional wood carver. Descriptive text accompanies each of the lithographic plates, and in order to emphasize and illustrate the various points made in describing a flower numerous small woodcuts are introduced, thus adding greatly to the value of the work. Mr. Hait is an enthusiast in his chosen study, and no can follow him without acquiring more or less of the enthusiastic zeal with which he investigates the characteristics of a plant or flower and applies them to decorative purposes. The book in its American edition is in convenient shape for use and should have a wide circulation.

Art and Decoration.

The first number of a new monthly magazine called *Art and Decoration* comes to us this month. It is a handsome publication of 34 pages, issued from No. 9 East Seventeenth street. Mr. Geo. R. Halm is art manager, and Mr. Caryl Coleman editor. The purpose of this magazine is eminently practical. It is devoted especially to useful ornament which can be employed in all forms of design and decoration, and very little, if anything, will claim a place in its pages which has nothing besides pictorial interest to commend it. Besides containing a large amount of original work, it will be eclectic to the extent of presenting the most useful and practical examples of design and ornament gathered from foreign periodicals. The illustrations and text of the first number relate chiefly to wall treatments in color, mantels, wood carving, underglaze tiles, lambrequins, wrought-iron work, gas fixtures, jewelry, Japanese mous and architectural ornaments in wood and stone. It is a very creditable effort, giving promise of permanent value, and deriving much of its interest from the charming initial letters, department headings, &c., designed by Mr. Halm.

The Roof of a Greek Temple.

The frequent references that are made to classical architecture whenever art and architectural subjects are up for consideration often raise questions in the minds of those specially interested in roofing as to the character of the roofs on ancient temples. The wonderful climate of Greece, as well as other portions of Southern Europe wherein these edifices were erected, made a roof in the sense in which we are accustomed to regarding that portion of a building comparatively unimportant. With no frost to commence the work of destruction almost as soon as the building was up, and with comparatively little annoyance from rain, the builders of ancient temples were never driven to the consideration of roofing problems in the way that the builders located in more northern climates have always been compelled to regard them. Accordingly, it is not surprising that specific descriptions of roofing as applied to classical structures are not very frequent in works of ancient architecture. In Viollet Le Duc's "Discourses on Architecture," however, in which he presents a wonderfully entertaining analysis of the motives of the builders of these ancient temples by which the various parts were formed and finished with a definite purpose in view, we find the engraving of which the accompanying cut is a reproduction. It shows the columns of a Greek temple with the frieze and cornice, the eaves of a roof covered with tile, and the gutter hollowed out of a solid block of stone and ornamented on the front. In this connection one or two brief quotations from the author named, and taken from that chapter in his famous work wherein he traces the construction of the Greek temple, may not be uninteresting to our readers.

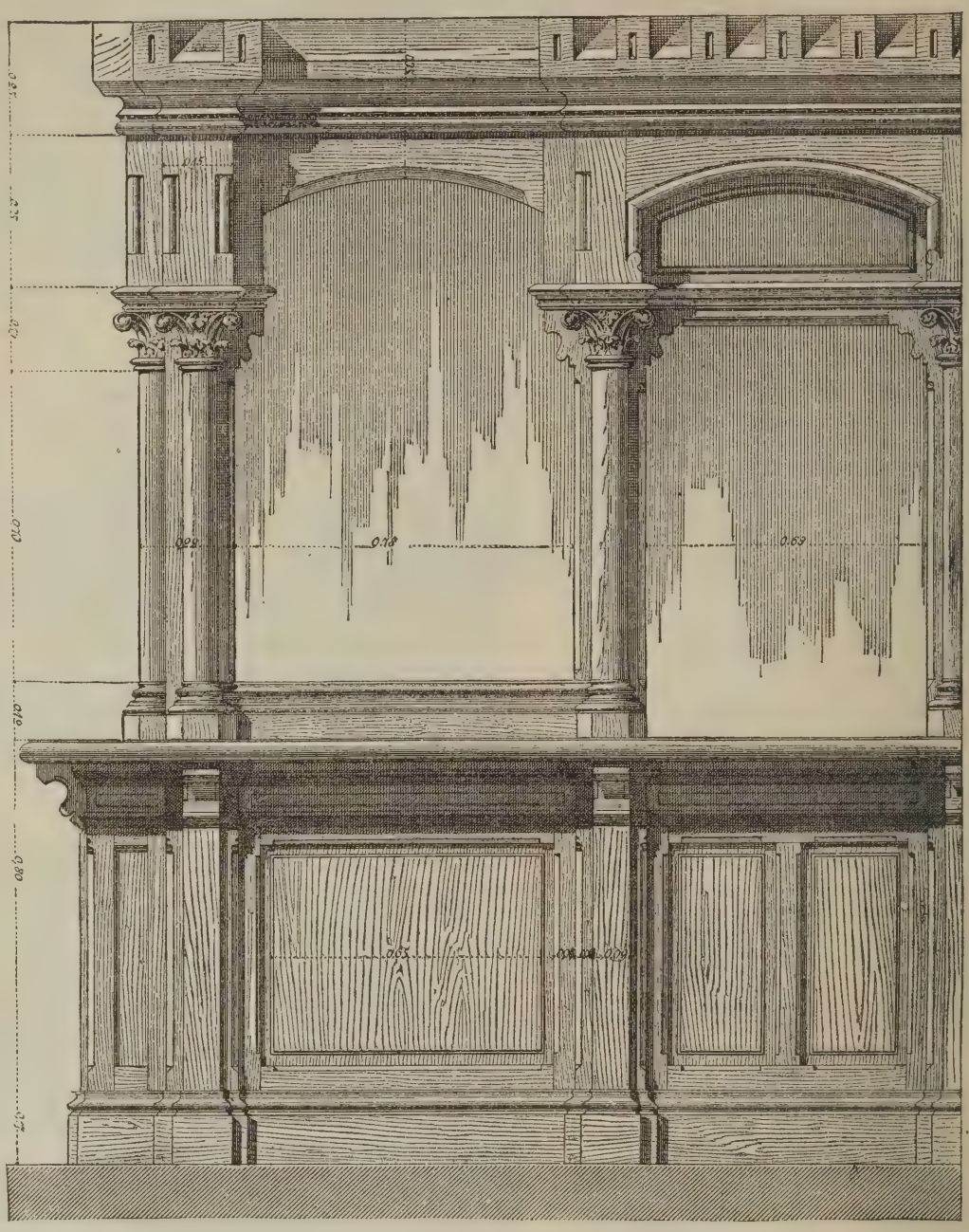


ROOF OF A GREEK TEMPLE, BY VIOLLET LE DUC.

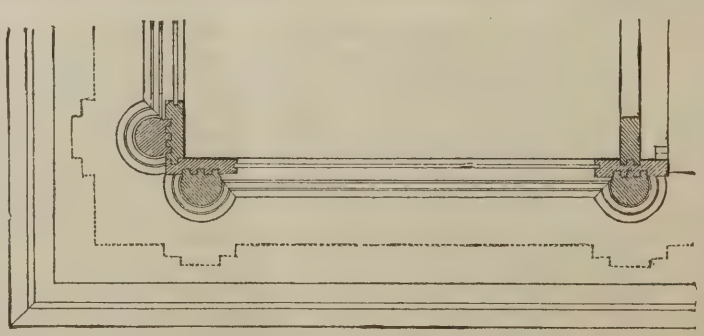
After mentioning that the cornice has a slight projection and does not bear on the whole thickness of the frieze, our author says: "The constructor remedies by his intelligence whatever difficulties may arise from his spare use of material; he observes, for instance, that the drops of rain, according to a physical law, follow the under horizontal surface of the projection of his cornice; he therefore, in order to avoid, as far as possible, the defacing effect of the wash of rain-water, inclines this surface upward, so that the water, when it has run down the perpendicular face, may fall on reaching the lower edge." A little further on in the same strain this writer presents the train of thought that he imagines must have occupied the ancient builder when working up to the use of a gutter at the eaves of his roof, and also the introduction of the drip of various moldings composing the cornice. "He has remarked that when it rains, the water, uniting with the deposit of dust on the vertical face of his exterior cornice, leaves there, as it runs down, unsightly stains, obscuring the purity of that part of the extreme projection of his structure which he desires to be brilliantly defined against the blue sky. He therefore lays upon his cornice-stone a gutter of marble or terra-cotta, and at intervals along its length he furnishes it with spouts to project the accumulated water from the face of the cornice, but the gutter itself, exposed to the rain on its face, is easily soiled, and to conceal this defect he covers it with sculpture or painting." These reasons for features of construction, which are very commonly imitated at the present time in a manner to burlesque the original, are instructive and cannot fail to interest the careful student. The absurdity of accurate reproductions of ancient classical architecture in modern structures is so forcibly illustrated by many buildings which are to be seen in various parts of the country, and which appear wonderfully out of place by reason of the very style in which they are built, scarcely require attention at this time. The climatic influence upon architecture, especially as affecting the pitch of roofs and the nature of the roof covering, has received considerable attention both from the author from whom we have been quoting and also from others equally eminent. In summing up a brief consideration of these facts Viollet Le Duc uses the following language: "These rapid glances at the *modus operandi* of Greek artists are sufficient to show that if the Parthenon is in its place at Athens, it is but ridiculous when imitated at Edinburgh." Further he says: "It is barbarous to reproduce a Greek temple at Paris or London, for such reproduction betrays ignorance of the principles which inspired the original, and such ignorance is barbarism."

French Cabinet Work.

The design on this and the succeeding page show a characteristic example of modern French cabinet work. The fittings represented are those of a bank. Fig. 1 shows general elevation of the work, while Fig. 3 presents a sectional view, indicating features of construction. Fig. 2 is a plan of the corner, while the remaining cuts show details to an enlarged scale. The dimensions given in engravings are to the metrical scale, and those of our readers who are accustomed to using the scale named will no doubt take pleasure in employing them. The scale in inches is also given under the various cuts. This work has been reproduced from plates in a modern French work, and the parts are so clearly shown that further description is scarcely necessary to make the construction understood by our readers.



French Cabinet Work.—Elevation of Bank Counter.—Scale, ¾ Inch to the Foot.

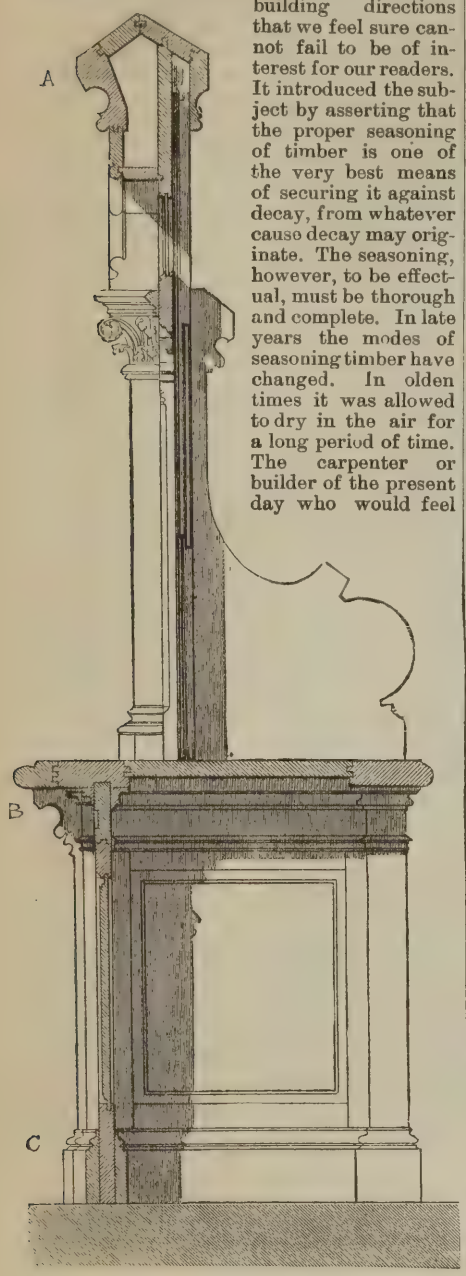


Plan of Corner.—Scale, ¾ Inch to the Foot.

The employment of cast-iron columns as main supports has been greatly restricted at Berlin by a regulation issued recently from the architect's department of the police authorities of that city, causing great consternation among builders. The cause of the new order is said to have been a discovery in connection with a fire last winter in the Alte-Jacobstrasse, when it was found that the cast-iron columns had been cracked by the effect of the cold-water jet playing upon them, so that the upper stories of the house were as near collapsing as they could possibly be. The Berlin police authorities insist upon it that where partition walls rest upon columns the latter are either to be bricked in or covered with a patent plastering in such a manner that an air space remains between the iron and the brick or plastering. In many cases a brick pier or granite pillars are prescribed.

The Wonderful Durability of Timber.

The *Lumber Trade Journal* recently presented a number of examples of remarkable durability of timber in engineering and building directions that we feel sure cannot fail to be of interest for our readers. It introduced the subject by asserting that the proper seasoning of timber is one of the very best means of securing it against decay, from whatever cause decay may originate. The seasoning, however, to be effectual, must be thorough and complete. In late years the modes of seasoning timber have changed. In olden times it was allowed to dry in the air for a long period of time. The carpenter or builder of the present day who would feel



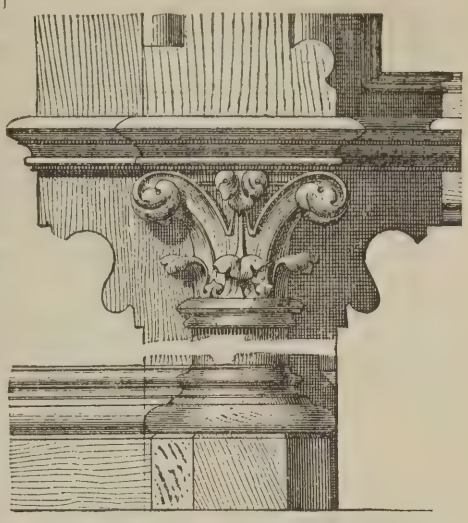
French Cabinet Work.—Vertical Cross-Section.—Scale ¾ Inch to the Foot.

any delight in the progress of his art cannot feel insensible to the advantage of giving durability to his materials, nor yet be uninterested in any inquiry into the probable extent of their duration. Not that his fame as an artist rests solely on the extent of their duration, for, while his productions are worthy of imitation, the remembrance of them will be preserved by the engraver's art as long as there shall be men capable of paying a just tribute to the memory of departed merit. The French army, in 1799, under the great Napoleon, destroyed the celebrated bridge across the Rhine, at Schaffhausen, but the fame of Grundenmann, the carpenter, will long continue, and the form of that excellent structure of the art will only cease to be remembered when carpentry itself no longer exists. We have introduced our subject in this way,

Cornice at A.—Scale, 2 Inches to the Foot.

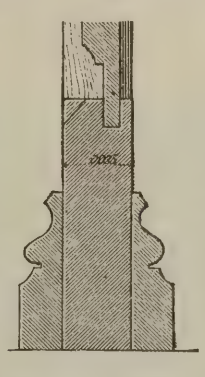
says the journal named, for the purpose of citing some of the most remarkable incidents on record in all history. We have taken the pains to condense a number of the most remarkable of these, as showing our readers how long timber has been preserved in an almost perfect state. Examples are not wanting in the history of Mexico, where timber has been found in a perfect state after being cut over 300 years ago. But our examples are obtained mostly from ancient history, and exist in the Old World. The piles of the bridge built by the Emperor Trajan across the Danube is a striking instance of the durability of timber in a wet state. One of these piles was taken up and found to be petrified to the depth of ¾ inch, but the rest of the wood was little different from its ordinary state, though it had been driven more than 16 centuries.

The piles under the piers of the London Bridge have been driven about 600 years, and from observations made by Dancis in 1746 it did not appear that they were materially decayed, and they are to-day sufficiently sound to support the massive superstructure. These piles are chiefly of elm. In digging away the foundation of the old Savoy Palace, London, some 60 years ago, which was built nearly 700 years before, the whole of the piles, consisting of oak, elm, beech and chestnut, were found in a perfect state of soundness, as also was the planking which covered the pile-heads. Some of the beech, however, after being exposed to the air a few weeks, though under cover, had a coating of fungus spread over its surface. On opening one of the tombs of Thibes, some 60 years ago, there were discovered two statues of wood, a little larger than life, and in good preservation, the only decayed parts being the sockets to receive the eyes. The wood of these statues is most probably the oldest in existence that bear traces of human labor. We believe they are in the British Museum to day. A continued range or curb of timber was discovered in pulling down a part of Trowbridge Castle, in Kent, which was built over 700 years ago. This curb was built into the middle of the thickness of the wall, and was, no doubt, to prevent the settlement likely to happen in such heavy piles of buildings, and therefore is an interesting fact in the history of constructive architecture, as well as an instance of the durability of timber. In digging for the foundation of the present house at Ditton Park, near Windsor, the timbers of a drawbridge were discovered about 10 feet below the surface of the ground; these timbers were sound, but had become black. Hakenwell says that Sir John de Molines obtained liberty to fortify the Manor House of Ditton, in 1396, and it is most probable the drawbridge was erected soon after that time; accordingly, the timber had been there about 400 years. The durability of the framed timbers of buildings is also very considerable. The trusses of the old part of the roof of the Basilica of St. Paul, of Rome, was framed in 816, and they were sound and in good condition in 1814, a space of nearly 1000 years. These trusses are of fir. The timberwork of the external domes of the church of St. Mark, at Venice, is more than 800 years old, and is still in a good state. The timber roof of Crosby Hall, in London, was erected over 300 years ago, and the roof of Westminster Hall, which is supposed to be of chestnut, is now over 350 years old. The rich carvings in oak which ornamented the ceilings of the "King's Room," in Stirling Castle, are many of them still in good preservation. It is nearly 350 years since they were executed, and they remained in their original situation till a part of the roof gave way, in 1777, when the whole was removed, and afterward were dispersed among the collectors of curious relics of the old times. In some of the old mansions which yet remain, and in ancient cathedrals and

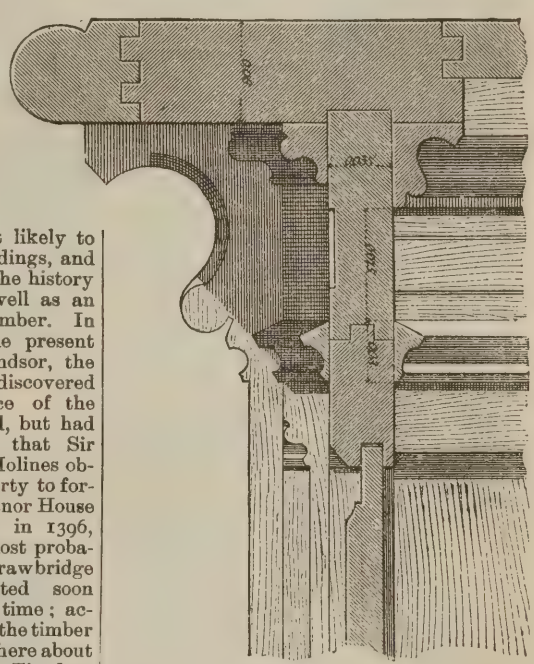


Detail of Capital and Base of Pilaster.—Scale, 2 Inches to the Foot.

churches, there is nothing like dry-rot found. In regard to the durability of the different woods, the most odoriferous kinds are generally esteemed the most durable; also the woods of a close and compact texture are generally more durable than those that



Base at C.—Scale, 2 Inches to the Foot.



Detail of Finish Under Counter.—Scale, 2 Inches to the Foot.

are open and porous; but there are exceptions, as the wood of the evergreen oak is more compact than that of the common oak, but not nearly so durable. If we were asked if any of the woodwork of this country of the present day would be found in existence 1000 years hence, we should promptly answer "No." Our woodwork, exposed to the rigors and uncertainties of climate, soon goes into decay.

Statistics of the building operations for last year reveal some curious facts as to relative growth of some of our principal cities. In new buildings Chicago is credited with having spent more money than any other Western city, which is very natural considering the population of the place, but St. Louis, which for the same reason ought to rank second, is fourth in the list, the second and third being Minneapolis and St. Paul.

NOVELTIES.

Willer's Sliding Blinds.

William Willer, of Fourth and Cedar streets, Milwaukee, Wis., has perfected and is now introducing a form of inside sliding blinds which is of interest to architects and builders generally. A very complete and comprehensive pamphlet illustrating and describing the constructive features employed, and showing the different styles in which the goods are manufactured, has been issued. From it we have selected Figs. 1 to 3, inclusive, of the engravings. These serve to illustrate some of the leading features, but more cuts and a longer description than we can spare space for at this time would be required to show the goods in all their forms and to indicate their wide application. Inside window blinds are a convenience, if not an actual necessity, in every modern house. Many faults exist in inside folding blinds as commonly employed which are overcome in sliding blinds. While various forms of sliding blinds have been before the building public for a long time past, and, therefore, in their general characteristics are not new, the manufacturer claims for the goods herewith illustrated that, in addition to the new features embodied, they are more carefully designed and better constructed than anything that has preceded them. Fig. 2 illustrates what is designated as "Class A, four sections, four grooves, with box at top." The blinds for this class are designed particularly for use in higher-priced buildings and dwellings, especially brick buildings. The blinds are made in four sections, and, as the frame is provided with a box at the top, all the sections or any part of them may be moved up into the box, where they are wholly hidden from view. The engraving shows all the sections down. Diagrams are given in the catalogue referred to, showing the sections in all the possible positions in which they may be used. Four other classes are similarly illustrated, each being work of a less expensive character than the one preceding it, from which it will be seen that these goods are adapted to a wide range of use. There are also presented in the pamphlet full-size sections through the frames, showing the sliding strips or guide-ways for each class, with various other important details, among which may be mentioned a page plate illustrating the system provided for removing the blinds from the window. Very specific and comprehensive directions to the carpenter are also given. Fig. 3 of the engravings we have selected shows the application of the springs and movable handles to each section, two important features of the construction employed. Fig. 1 shows the system of operating the slats, by which it will be seen the usual rod in front of the slats is dispensed with. The small connecting-rods at the ends of the slats are made of steel and are fastened with steel pins, and when in use are almost invisible. The slats have the good quality of remaining in any desired position without the use of slat fasteners. A page at the close of the pamphlet is devoted to a comparison of cost between these goods and the competing article made to fold, from which it would appear that the sliding blinds are the cheaper.

Novelties. — Fig. 1. — System for Operating Slats in Willer's Sliding Blinds.

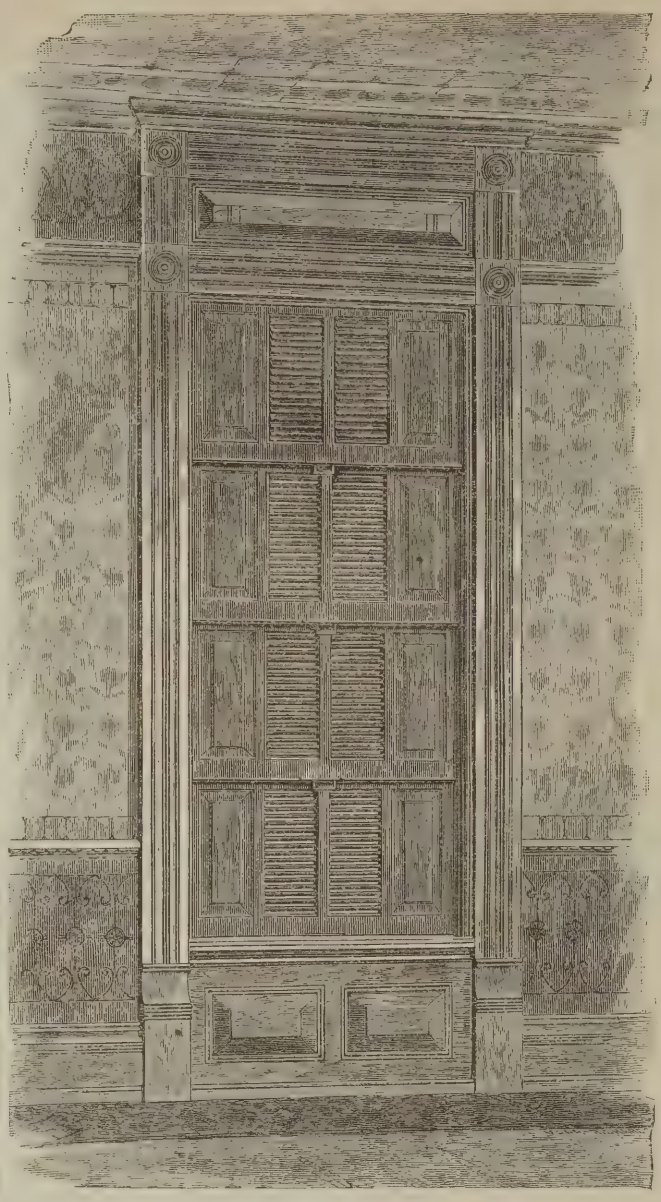


Fig. 2.—General View of Blinds of Class A

New 10-Inch Molding Machine.

Levi Houston, of Montgomery, Pa., has recently completed a new 10-inch molding machine which embodies some improvements over other machines of its class previously on the market. The crowded condition of our columns prevents our publishing an engraving of it, but we can probably indicate its merits in a way to be understood by all of our readers who are interested in such devices. The machine has been produced to supply the wants of car shops and large molding establishments. It is provided with a roughing-out or extra top head, a feature that is important where very deep and heavy moldings are to be run and an extra smooth finish is required. The manufacturer states that the machine is capable of working any molding not exceeding 10 inches in width and 5 inches in depth. It will also dress on four sides flooring and sheeting. It will also do planing and matching, up to 10 inches wide. A table is securely gibbed to the middle of the frame at the rear end, near the under cutter. It is also solidly clamped to the frame at the front end. It further has the support of two large adjusting screws, which are geared at the bottom with a powerful train of gears, making it easy to raise and lower the table. The under cutter has a horizontal and vertical adjustment, and is provided with a very heavy and substantial pressure bar. The inside and outside headstocks are also adjustable. The top headstocks have a lateral adjustment, and are provided with an out-

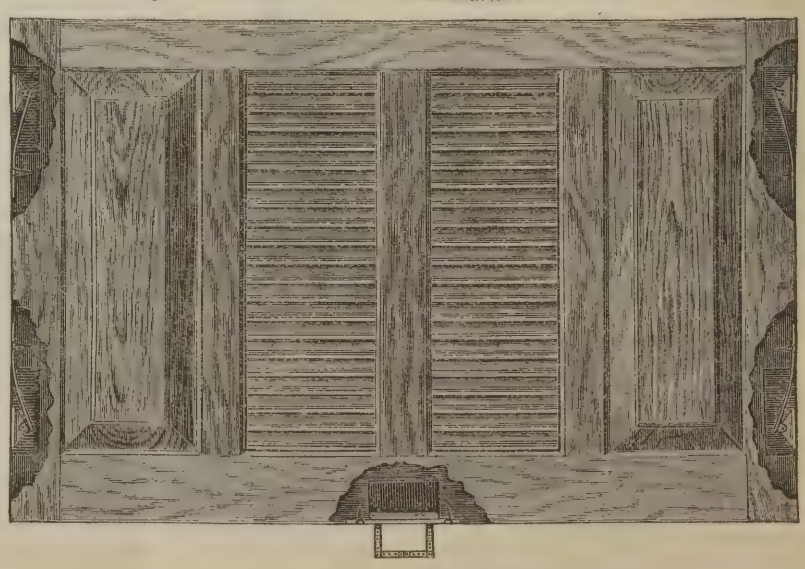
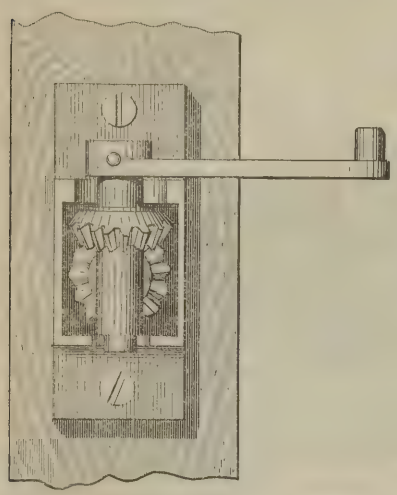


Fig. 3.—Application of Springs and Movable Handles.

side bearing. The feeding mechanism is of improved construction, consisting of four 6-inch rolls. The upper rolls are fluted and heavily weighted and are hung in such a manner as to raise parallel with the bed, thus giving them an equal bearing the full width of the lumber. All four rolls are driven with a continuous train of gears, constituting, the maker claims, the most powerful feed yet applied to any wood-working machine.

New Shutter Worker.

The Dudley Shutter Worker and Burglar Alarm Company, Nos. 105 and 106 Temple Court, New York City, who are already well



Novelties.—Fig. 4.—Outside Mechanism of the "Universal" Blind Opener.

known to many of our subscribers on account of their goods, which have been extensively advertised in our columns for many months past, have recently added to their assortment of shutter hardware the device shown in figures 4, 5 and 6 of the engravings. This opener is known to the trade as the "Universal" blind opener, and is intended to be applied to shutters already in place, or to be used in connection with any style of hinge that may be preferred. Most

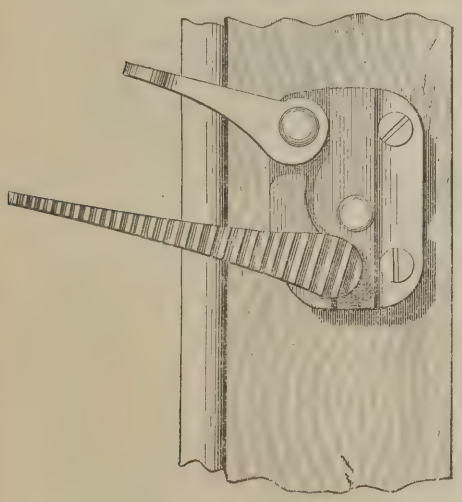


Fig. 5.—Inside Fixture of the "Universal" Blind Opener.

of the other shutter workers which are in the market anticipate the substitution of a special hinge in order to make the device available. This article has the merit of being used under any and all circumstances without special provision. Its features will be readily understood by examination of the cuts. Fig. 6 shows a horizontal section of a window with a fixture in place. It will be seen that it is operated from the inside by means of a crank or lever. By turning this lever motion is conveyed to the shaft running through the casing, which operates bevel gear inclosed in an iron box placed on the outside casing. This in turn operates a lever which engages in a slotted arm that is secured to the stile of the shutter. By this means it is possible to open the shutter or close the same without raising the sash. The lever, an enlarged view of which is shown in Fig. 5, makes a half revolution in opening or closing the shutter. It is clamped or locked in position by the small catch shown above it. An outside view of the box, with the plate removed, revealing the bevel gear is shown in Fig. 4. It will be seen that the parts of this device are comparatively few in number, are simple in the extreme, and that it is of a character to be readily applied under any and all conditions. The rods are sent out in a length equal to the longest ever required, and are cut, as necessary, by those who put the fixture in place. In location the opener is placed at such a hight as to be most convenient for use. It may be put at the bottom of the shutter or midway of its hight, as may be preferred. Two styles of inside fixtures are furnished, nickel or japanned in bronze color.

New Buzz Planer and Gauge Lathe

Among the new devices brought out by the Egan Company, No. 221 West Front street, Cincinnati, Ohio, may be mentioned

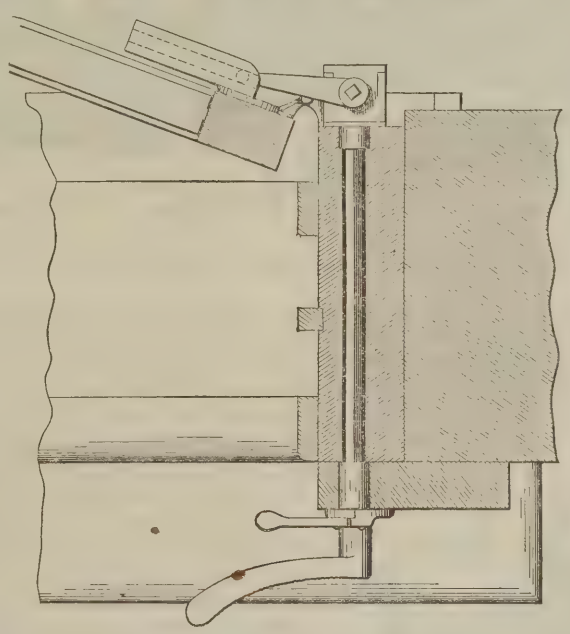


Fig. 6.—Horizontal Section Through Window Fitted with "Universal" Blind Opener.

a solid iron-frame buzz planer and jointer, provided with extra-long tables and adjustable fence. This tool is built from entirely new designs and patterns, and the manufacturers assure us that great care has been taken that everything about it should be first-class in all particulars. Five sizes are made, working from 8 to 24 inches wide The tool is especially designed for making perfect glue joints, either straight or slightly hollowing. It can also be used for chamfering, beveling, trueing up, taking out of wind and for other similar purposes. Another tool recently perfected by the same company is an improved automatic gauge lathe with back sliding knife. This tool has been designed for such as chair work, balusters and similar articles which are to be turned in large quantities with great rapidity. The manufacturers state that it is particularly adapted for making and finishing the work very smooth, leaving it in a condition to require very little, if any, sandpapering after it comes from the machine The device is simple in its parts, accurate working and very efficient.

Coxhead's Combined Saw-Set and Vise.

John F. Coxhead, Poughkeepsie, N. Y., is offering to the trade a combined saw-set and vise, the construction and working of which is shown in the illustrations following. This appliance, which is said to be an entire novelty, in that it combines in one article both saw-set and saw-vise, consists of three parts—the vise proper in two pieces held together by a bolt and thumb-

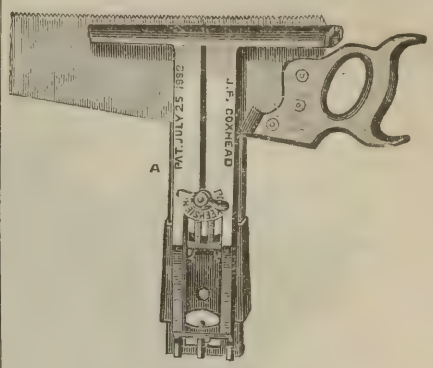


Fig. 7.—Coxhead's Combined Saw-Set and Vise.—Arrangement of Vise for Filing Saw.

screw; the anvil, a cast-iron bar having four different bevels, and the cast-iron bracket screwed to a bench for holding the vise. Fig. 7 shows the tool used as a vise for holding the saw during filing. The vise is held in a vertical position in the bracket into which it slides, and the saw, placed between the clamps, is fastened by means of the thumb-screw which passes through grooves in both pieces of the vise. To use as a set, as shown in Fig. 8, the vise is slipped from the bracket and laid flat on the bench, the thumb-screw is loosened and the upper clamp slid back a short distance, two small lugs on the underneath clamp holding the parts in the right relative position. The anvil, a small bar the four edges of which are given different bevels, is next placed in a groove in the lower clamp, parallel to the jaw and projecting beyond the upper jaw the width of the bevel. The saw to be set is then clamped in position by the thumb-screw, so that the teeth overhang the bevel of the anvil. The saw can then be set with a hammer. Another form of the vise is made for filing and setting circular

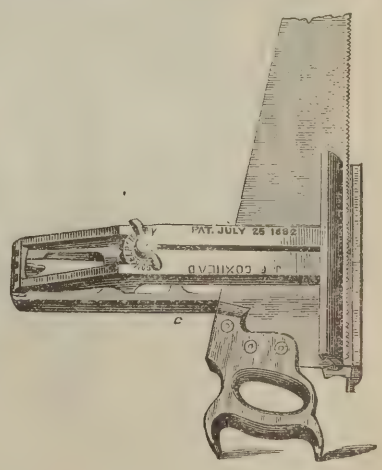
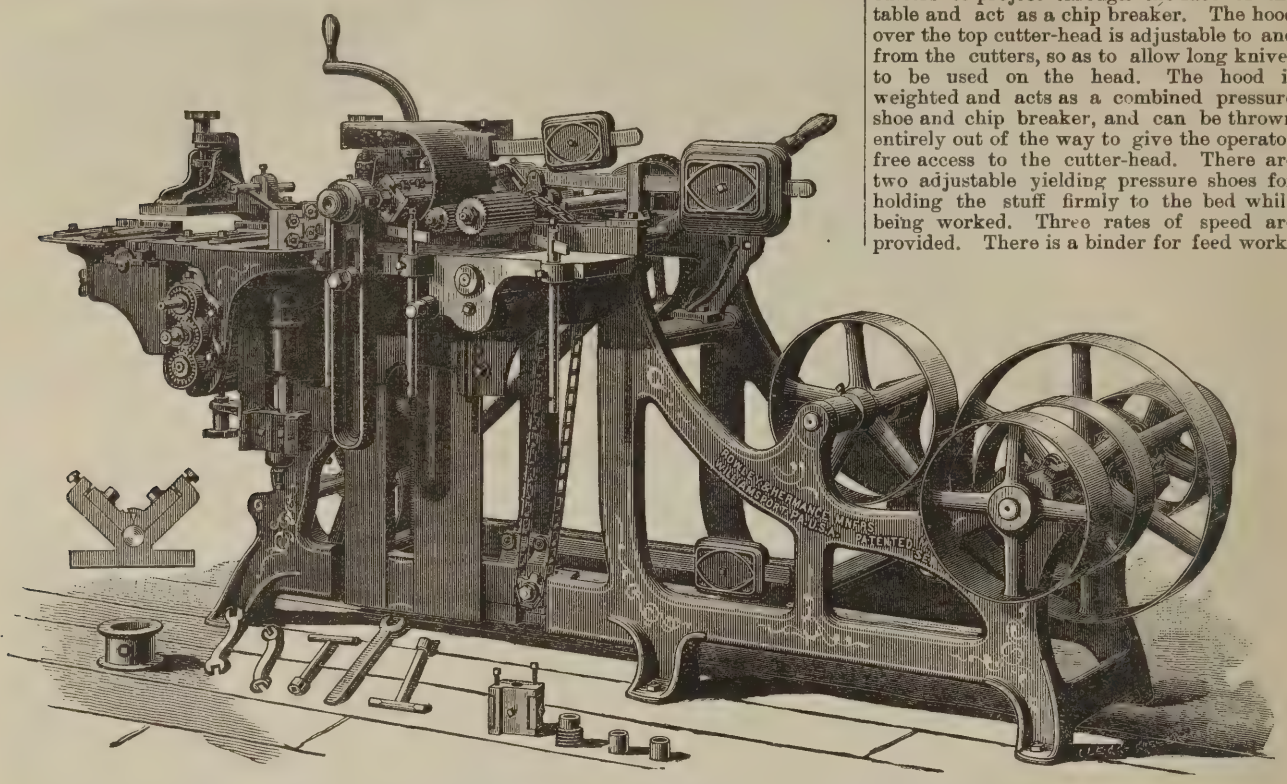


Fig. 8.—Arrangement of Vise for Setting Saw.

saws. The method of its use is practically the same as explained in the foregoing and therefore no further description considered necessary.

Four-Sided Molder.

Messrs. Rowley & Hermance, Williamsport, Pa., have recently put upon the market an improved 6-inch four-sided molder, with outside bearings, shown in Fig. 9 of the engravings. The principal fault with molding machines as heretofore made has been that the feed works have not been strong enough to carry the work through. This has made it necessary for the operator to push and crowd the stuff. Especially has this been the case when the material was damp. The necessity of supplementary work of this kind is not only annoying to the workmen, but is also expensive to the proprietor, since valuable time is lost. In the machine illustrated the makers claim that they have an entirely new device for gearing the under feed-roll so as to constitute this the strongest feed 6-inch molding machine in use. The under roll, it is asserted, is so geared that it feeds equally strong when the bed is lowered to 14 inches as when working thin stuff. This will be recognized as an important feature in sticking door stiles or rails or other wide stock, and, it is claimed, cannot be found in other machines. Two upper feed-rolls are provided. One is weighted and the other is held firmly by springs. The frame is strong, and is in one solid casting. The table is raised and lowered by a crank underneath the table and convenient to the operator. The top headstock has a lateral adjustment. By a novel device the outside headstock can be set at any angle desired and fastened, and can then be moved out and in and up and down accurately while the machine is in motion. The inside headstock has a horizontal adjustment. A slide is fitted into the table that can be moved to and from the under cutter-head so as to allow cutters to project through the face of the table and act as a chip breaker. The hood over the top cutter-head is adjustable to and from the cutters, so as to allow long knives to be used on the head. The hood is weighted and acts as a combined pressure shoe and chip breaker, and can be thrown entirely out of the way to give the operator free access to the cutter-head. There are two adjustable yielding pressure shoes for holding the stuff firmly to the bed while being worked. Three rates of speed are provided. There is a binder for feed works instead of a clutch, thus giving the operator control of his work. The weight of the machine is about 1500 pounds.



Novelties.—Fig. 9.—New Four-Sided Molder, Built by Rowley & Hermance, Williamsport, Pa.

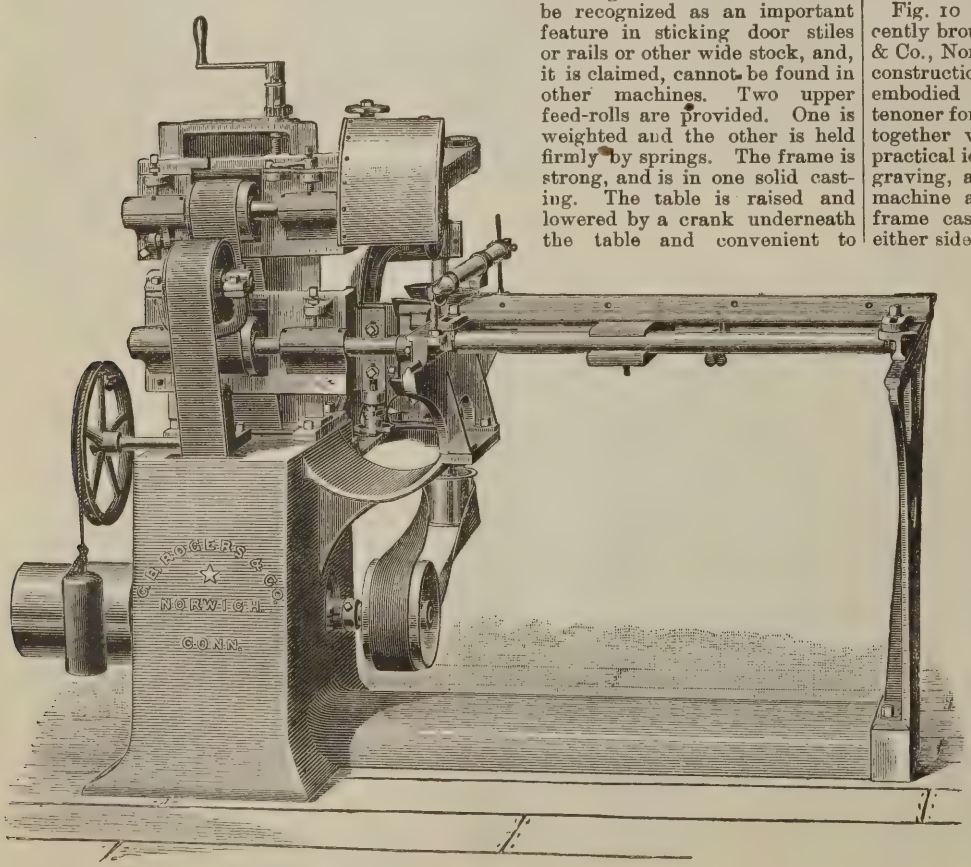


Fig. 10.—New Pedestal Tenoner, Built by C. B. Rogers & Co., Norwich, Conn.

Pedestal Tenoner.

Fig. 10 represents a pedestal tenoner recently brought out by Messrs. C. B. Rogers & Co., Norwich, Conn. In the design and construction of this machine there have been embodied the best features of the style of tenoner formerly manufactured by this firm, together with some new and thoroughly practical ideas As may be seen by the engraving, all of the working parts of the machine are supported on a heavy iron frame cast in pedestal form. To it on either side are attached boxes for the main countershaft. Attached to this column and cast with it is an arm with a V-shaped track that supports one end of the carriage or table, the other being carried by a smooth way attached to the extension of the foot or base of the machine. With this arrangement of the way the operator is enabled to follow the carriage uniil the work has passed the cope cutters. The cutter-heads, with straight cutters set for a draw cut, are attached to heavy steel spindles running in self-oiling connected boxes, to which are also hung the cope-heads, the whole being gibbed to the upright. By an ingenious arrangement the heads are raised and lowered independent of each other, or they may be adjusted together to any desired hight above the carriage without altering their relative positions. The copes, being hung on the same yoke with the tenoning heads, when once set require no further attention. They are, however, provided with both horizontal and lateral independent adjustment. The pulleys on cutter-head spindles, as well as the main driving pulley on the counter, are placed between the bearings, and all the other pulleys are placed close to the bearing, thus adding greatly to the stability and capacity of the machine. The makers claim

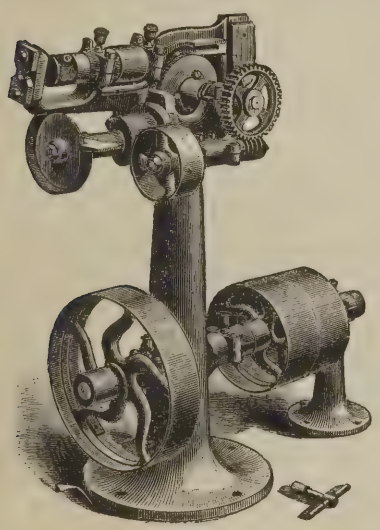
that the arrangement of this machine is such that every necessary adjustment may be made from the operator's position in front of the carriage. There is furnished with this machine a double head to work tenons six inches long at one cut, or single heads to cut three inches, either with one or two copes, as desired. The weight of this machine is about 1300 pounds and the power required to run it is about 3 horse-power.

Reserved Seat Guards.

M. E. O'Connor, No. 95 Chambers street, New York, is putting upon the market a novelty in the hardware line which he calls a reserved seat guard. The device is adapted for use in halls, theaters and churches. It consists of a lock and chain, with suitable trimmings and connections. The lock is of such a form as to be fastened against the side of a seat or the end of a pew by two screws. One of the screws at the same time fastens in place one end of the chain, a fitting provided on the end of the chain being inserted in an opening in the side of the lock case for the purpose. In use, the opposite end of the chain would reach forward and connect with the next lock in front, from which position it would be released by the key. The chains in the samples we have inspected have been incased in a covering of plush. The locks are of bright brass, the whole forming a neat and attractive article for the purpose.

Small Dowel Machine.

In Fig. 11 we show a machine designed for turning small dowels up to ⅞-inch diameter, manufactured by Messrs. Webber &



Novelties.—Fig. 11.—Small Dowel Machine.

Philbrick, Waterville, Me. The machine is very compact in its general design, simple in its parts and effective in its execution. The feed is very strong and is quickly adjusted to the different sizes. The feed disks are both on the same shaft, thus avoiding all strain or friction on the bearing which is caused by using heavy weights sometimes employed in machines of this class. The feed disks are driven by a worm and worm gear, as shown in the engraving. A small saw is attached to the machine for trimming or squaring the ends of the sticks before entering the head. The arrangement of pulleys employed is clearly shown in the engraving. The best results on this machine are attained when driving it 600 revolutions per minute.

The Perfection Saw-Set.

The saw-set shown in Fig. 12 is known in the trade as the "Perfection," and is claimed by the maker, John A. Fischer, Covington, Ky., to be the most perfect saw-set now before the trade. It is claimed, further, to be the only one that will set the teeth of hand-saws, band-saws, scroll-saws and meat-saws without injuring the teeth after the saw has been sharpened. The parts of this device are clearly shown in the engraving. The thumb-screw on the upper lever is attached to a guide, which may be moved back and forward on the anvil to suit the different sizes of tooth. The thumb-screw on the lower lever may be raised or lowered to regulate the pitch of the tooth to suit any kind of work. After the set has been adjusted the tooth side of the saw is laid over on the anvil. Then with a light pressure on the lever the teeth are set one at a time, care being exercised to have the gauge so adjusted as to admit but one-third of the tooth. In setting band-saws and scroll-saws the swedge between the upper and middle levers is used, the back of the saw being placed under the slide. This is adjustable to various widths. A gentle pressure is applied on the two upper levers in the same general manner as already explained. The maker claims that the tool is made of the best steel, and that the anvil in both front and rear is tempered by a new process that insures great durability. The tools as sent out are finely polished, and are said to be desirable additions to the chest of any carpenter.

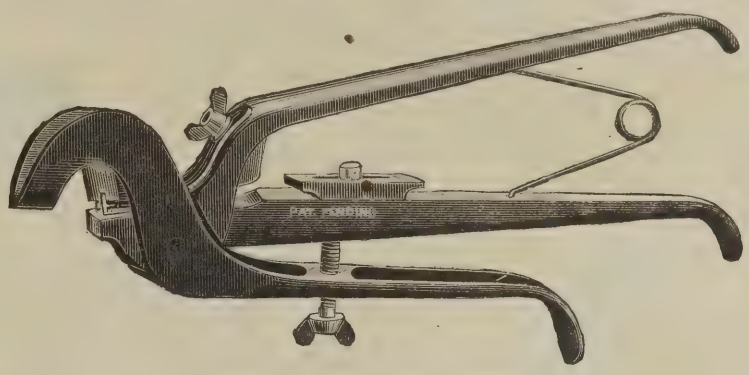


Fig. 12.—The Perfection Saw-Set.

Combined Furring and Lathing.

Fig. 13 shows a new article that is being offered to the building trades by the Stanley Corrugated Fire Proof Lathing Company, with office at 239 Broadway, New York. Wire lathing has been before the public for some time and has been extensively used in various directions, but certain objections attend its employment. The object of the present improvement has been to provide such a form of wire lathing as would overcome the necessity of cross furring and at the same time stiffen the material so as to make it more convenient for use than anything that has preceded it. To this end wire cloth with mesh of about ⅜ inch is corrugated, the corrugations running lengthwise of the sheets and being about 6 inches apart and ⅜ inch deep. The engraving shows a section of the material thus prepared applied directly upon the under side of floor timbers. It is fastened in place by means of staples, the corrugations running transversely of the timbers and taking the place of furring strips. This construction, the makers claim, saves the labor, space and cost of material of furring usual to an ordinary wood or iron building. The corrugations add rigidity to the surface and secure the lathing at such a distance from the beams as to give a perfect and continuous key to the plaster. Another advantage is that by this construction wooden floor beams are so sealed as to prevent the spread of fires under the floors. This by the use of ordinary furring is not accomplished, since the space under the floors is practically one large opening. With the use of this form of lathing, however, the plaster comes directly against the face of the individual floor timbers, thus dividing the space under the floor into a series of compartments with no chance of draft, and consequently no liability of fire spreading from one to another. The makers claim further that with the use of this material an ordinary frame structure becomes more secure against fire than it could be made by any other known process. The lathing is readily adjusted to walls, ceilings, girders and columns by ordinary mechanics, resulting in a saving in the usual expense of skilled labor. It is adapted to fire-proof structures where iron beams and brick arches are used, and is claimed to have the advantage of less cost than other fire-proofing systems. It may be applied to columns and girders, affording a desirable protection against heat to these important parts of building construction. An important economy in space is attained, since 1 inch is all the space that is occupied in forming a finished surface, measuring from the face of the beam. The danger of cracking or displacement of mortar either from the effect of fire or water or warping, it is claimed, is entirely obviated. Accordingly, the manufacturers call attention to the fact that this material is of great value as a base for artistic decorations. They also direct attention to its advantages from a sanitary point of view. Among the prominent buildings in which this material has been used may be mentioned some of the new schoolhouses which are being erected in this city.

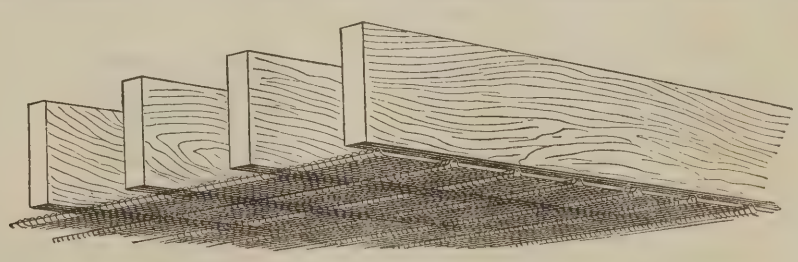


Fig. 13.—Combined Furring and Lathing.

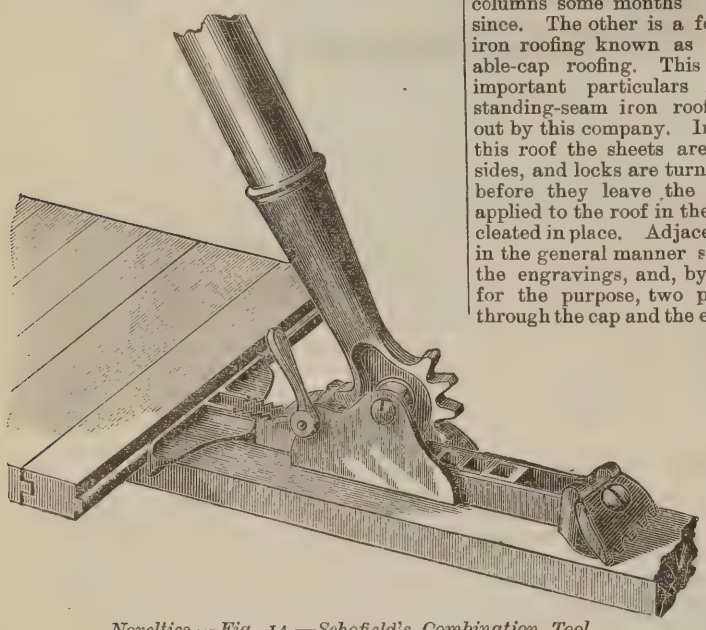
New Band-Saw.

The use of the band-saw machine has wonderfully increased within the past 10 or 12 years, and in consequence a great deal of skill and ingenuity has been brought to bear on their manufacture in order to produce a good article at a low cost. Frank H. Clement, of 131 Mill street, Rochester, N. Y., began the business in a small way in 1874, and has made an almost exclusive specialty of these tools since that date, during which he has made many improvements. His latest design is a machine with 34-inch wheels, which, he claims, will be found to possess all the requisites of a good, well-designed and well-constructed tool. Among the leading features of this machine may be mentioned the following: The wheels are extra light and strong; the shafts are of steel; the boxes are four diameters in length; the main frame is cast in one piece; the loose pulley is self-oiling; the guides are of the most approved form, and are adjustable in every direction; there is a belt-shifter and saw-dust brush, and the main table tilts to an angle; iron or wood tables are furnished as ordered. Mr. Clement informs us

that this machine weighs more and is more powerful than many 36-inch saws, and is guaranteed to do just as much and just as good work as the best of them.

Combination Tool.

John Schofield, No. 86 E. Wasnington street, Chicago, Ill., is putting upon the market a combination tool which he calls "The Little Giant," that perhaps embodies more uses than almost any other single tool that could be cited. Fig. 14 presents a general view of the device as used as a floor clamp, and will serve to illustrate the several uses to which the article may be applied. By examination of the engraving it will be seen that the parts are extremely simple. It consists of a rack and pinion movement, the rack sliding in a case, and carrying on its outer end a face-plate which bears against the work. A second rack in which a catch works takes up the motion and holds the face-plate at whatever point it may be pushed by the



Novelties.—Fig. 14.—Schofield's Combination Tool.

action of the lever. The opposite end of the tool is provided with a knife which screws in place in such a way as to impinge the surface with which it comes in contact. By this means the tool is held securely in position, and a bearing is afforded against which it presses in doing the work. The manufacturer asserts that carpenters who have used this clamp claim that it is very desirable for the purpose. It is light, and may be carried in any tool chest or box, occupying no more room than an ordinary smoothing plane. The greatest interest, however, that centers in this tool depends upon the various combinations that may be made out of the simple parts that are furnished with it, and the numerous uses to which it may be put. By substituting a comb-shaped piece in place of the knife shown at the back in the engraving and adding a similar, but longer, piece to the face-plate, and attaching a hook to the slide bar which is provided for the purpose, the article becomes a very satisfactory carpet stretcher, and one which housewives will generally appreciate. Using two of the tools in the same general manner as illustrated in Fig. 14, a very desirable clamp is provided for such work as doors, sash, &c., or for holding work for gluing. A very simple vise attachment is also provided by which the tool is fastened to a work-bench, and it then serves as a saw clamp and a vise for holding light work. When used in the form shown in Fig. 14 it also answers a useful purpose for moving ing columns into place or for shifting heavy weights of any kind across a floor. By replacing the knife at the back with a special shoe which is provided for the purpose, and using the tool in a vertical position, it becomes a lifting jack, and has sufficient strength to raise a considerable weight. Using the knife at the back as shown in the engraving, and adding to the face-plate a special plate provided for the purpose, the tool constitutes a desirable box opener. By similar combinations and changes it may be used as a wagon-jack, as a cider or cheese press, letter copying press, portable mortising machine and for still other purposes. A very neat little catalogue has been prepared by the manufacturer illustrating the different uses to which this tool may be put, which is sent to any address on application.

Adjustable-Cap Roofing.

The Garry Iron Roofing Company, of Cleveland, Ohio, announce two new specialties in the way of iron roofs which are of undoubted interest to builders. One of these is a sheet-metal shingle or tile, being an improvement on a similar article that was illustrated and described in these columns some months since. The other is a form of plain sheet-iron roofing known as the Garry adjustable-cap roofing. This differs in several important particulars from the style of standing-seam iron roofing heretofore put out by this company. In the preparation of this roof the sheets are edged along their sides, and locks are turned across their ends before they leave the factory. They are applied to the roof in the usual manner, and cleated in place. Adjacent edges are capped in the general manner shown in Fig. 15 of the engravings, and, by a special tool used for the purpose, two parallel slits are cut through the cap and the edges of the iron. The metal is pressed outwardly and inwardly in the general manner shown in the engraving. In order to attach the parts to each other in a way to hold them firmly in place a pin is inserted, as clearly illustrated. This construction is claimed by the manufacturers to be cheap, durable and free from liability of coming loose or otherwise giving trouble. They claim that the plan here illustrated of fastening the cap in place makes this form of iron roofing the easiest and quickest applied of any in the market, especially for steep roofs.

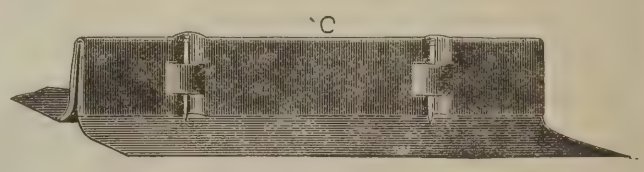


Fig. 15.—Adjustable-Cap Iron Roofing.

Window Garden.

Samuel C. Tatum & Co., corner of Jonn and Water streets, Cincinnati, Ohio, are putting upon the market a window garden, the construction of which is of interest to builders and all who have occasion to employ an article of this kind. The garden as arranged consists of brackets which project from the side of the window, and a front rail or guard which joins these at the corners, and which is in two pieces, lapping or slipping by in the center, so as to accommodate the device

Fig. 16.—Details of Tatum's Window Garden.

to windows of any width. The cast-iron parts are so constructed as to afford a bearing for a wooden bottom, which is the only piece that needs to be cut to fit the size of the window. The side bracket and the front guard are joined at the corners in a peculiar manner, the joint being illustrated in Fig. 16 of the engravings. When the bottom board has been cut to proper length it drops readily into place and rests upon projections on the inside of the frame. It serves the purpose of holding the frame in place, and at the same time constitutes the bottom of the article. By removing the board the frame can be taken out of the window readily. The makers inform us that these articles pack into very small space in shipping, and that already a very considerable demand has been created for them. The device can be used either on the outside or inside of a window without any other changes than would be suggested by inspection to any handy mechanic.

New Store-Door Lock.

A new store-door dead lock has been recently brought out by the Miller Lock Company, 821 Cherry street, Philadelphia. Some months since (see October and November issues for 1884) we illustrated some of the locks of the "Champion" series, to which this lock belongs, and described their mechanical features. The present lock is an adaptation of the general scheme of design and construction then presented to locks for store doors. Like the others it operates with a small flat key. It is adjustable to right or left hand doors varying in thickness from 1⅜ inches to 3 inches. The key works from the outside only, the inside being furnished with a knob. The case measures 2½ x 4 inches, and is japanned. The bolt is bronze, and is 2 x ⅜ inches in size. Two styles are made—with plain bronze escutcheon and with nickel-plated escutcheon. The lock is adjustable to different thicknesses of door by a very simple device. A bar of metal connects the spindle with the knob. This bar is furnished 3 inches long, and is to be cut off by the workman putting the lock in place to suit requirements. The escutcheon on the front of the door is threaded, and the cylinder of the lock screws into it. It is provided with spurs on the surface coming against the door, and the effect of screwing the cylinder into it is to cause it to press tightly against the face of the door, thus holding it securely in position. The throw of the bolt is ⅝ inch. The construction is such that the key will not come out without locking the door after it has been inserted for that purpose. The inside knob is adjusted by pulling out and turning a quarter revolution. In this position the bolt is held back. When in this position the lock can still be operated from the outside by the key, by inserting it and turning the quarter revolution, when the knob drops back into its original position, thus allowing the key to move the bolt. From this it will be seen that the lock is always under perfect control from either side. The makers direct attention to the fact that the present lock is very simple in its parts, and therefore cheaper than other locks of the same general character. Messrs. Fairbanks & Co., 311 Broadway, New York, with branch offices in various cities of the country, are general agents for this lock.

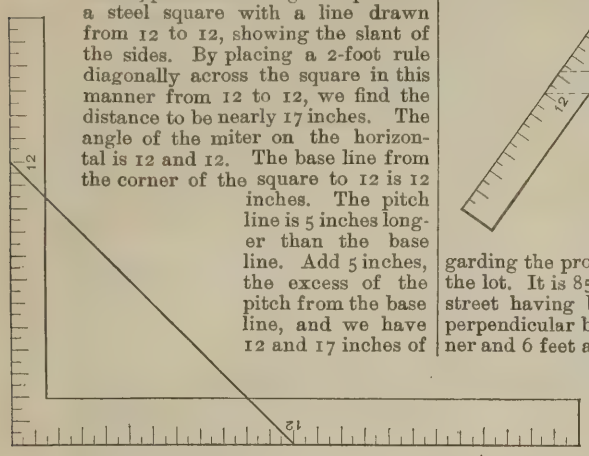
A French authority gives the following receipt for a transparent cement which possesses great tenacity and has not the slightest yellow tinge. Mix in a well-stoppered bottle 10 drams of chloroform with 10½ drams of non-vulcanized caoutchouc cut in small pieces. Solution is readily effected, and when it is completed add 2½ drams of mastic. Let the whole macerate from eight to ten days without the application of any heat, and shake the contents of the bottle at intervals. A perfectly white and very adhesive cement is said to be the result.

M. K. Jessup has presented a valuable collection of American woods to the American Museum of Natural History. The specimens are arranged in the sequence of their botanical relationship, and are cut in such a manner as to display the bark, and cross and longitudinal sections of the wood, both polished and in its natural condition. They are supplemented in the case of trees of commercial importance by carefully selected planks or turls, which often show better than logs the true industrial value of the wood.

CORRESPONDENCE.

Problem in Hopper Bevels.

From L. H. B., *Corning, N. Y.*—I propose giving a rule for hopper bevels that does not require a drawing, and which perhaps will be new to some of the readers of *Carpentry and Building*. In Fig. 1 of the accompanying sketches there is illustrated the manner of getting the line, while Figs. 2, 3 and 4 indicate applications. Fig. 1 represents a steel square with a line drawn from 12 to 12, showing the slant of the sides. By placing a 2-foot rule diagonally across the square in this manner from 12 to 12, we find the distance to be nearly 17 inches. The angle of the miter on the horizontal is 12 and 12. The base line from the corner of the square to 12 is 12 inches. The pitch line is 5 inches longer than the base line. Add 5 inches, the excess of the pitch from the base line, and we have 12 and 17 inches of bevel and miter. The application of this is shown in Figs. 2 and 3. For a butt joint the sides slant two ways on each angle. The angle on the horizontal is a right angle. The excess of the pitch from the base line on one side is 5 inches, and on two sides is 10 inches, making an angle or joint 12 and 10, as shown in Fig. 4. The latter figure shows the application of the rule named, the material being square.



Problem in Hopper Bevels.—Fig. 1.—Manner of Getting the Line.

Colors for House Painting.

From OLD SUBSCRIBER, *Troy, N. Y.*—Will you kindly suggest, through the columns of *Carpentry and Building*, suitable combinations of colors for painting the cottage illustrated in the July number of the journal for 1879. The house stands at the top of a hill, 20 feet back from the sidewalk and about 8 feet above the walk. Since the house shows a 28-inch wall and has a narrow front, it would seem to me to require such a combination of colors as would tend to reduce the apparent hight of the building, or, in other words, to cause it to look wider. The roof is dark red at present, and does not need painting, but might be changed in color, more especially if any pleasing result demanded it.

I would also feel grateful for advice regarding the proper treatment of the front of the lot. It is 85 feet wide, and, owing to the street having been recently graded, has a perpendicular bank 2 feet at the upper corner and 6 feet at the lower. If the bank was of uniform hight it would be a simple matter to slope or terrace it, but, inasmuch as it is three times as high at one point as at the other, to terrace it would necessitate cutting back into the lot many feet at the lower corner and scarcely any at the upper. This possibly would spoil the interior arrangement of the grounds. I have been advised to use a wall laid in cement, but fear the effect would not be pleasing, and, besides, the expense would no doubt be very considerable.

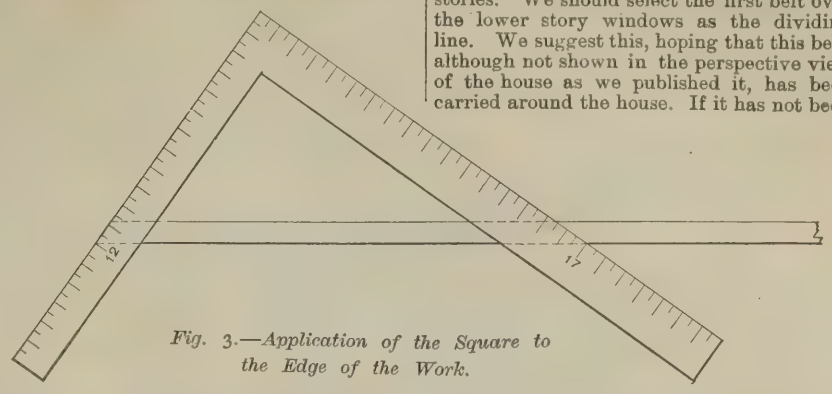


Fig. 3.—Application of the Square to the Edge of the Work.

Answer.—As the proportions of the house described are narrow for its hight, we advise dividing the hight by color into two distinct stories. We should select the first belt over the lower story windows as the dividing line. We suggest this, hoping that this belt, although not shown in the perspective view of the house as we published it, has been carried around the house. If it has not been carried around, select the line of clapboards nearest the level of the belt as the line. Paint the entire first story a good, strong bronze green. Paint the entire trimmings of the house the same as the lower story. Paint the clapboards in the second story and the shingles between the first and second story windows a yellow brown. Paint the shingles in the gables a clear venetian red, with the exception of those over the kitchen entrance, which should be yellow brown. Do not attempt decorating the chamfer or trimmings of any kind by a second color. The blinds, if there are any, should be painted the darkest green your painters can mix. The doors should be the same, without the relief of a second color. Draw the sash black. The chimney, if of red brick, should be oiled; if painted now, paint again with Indian red. The roof is very well as it is, but if you choose to paint it try a dark moss green.

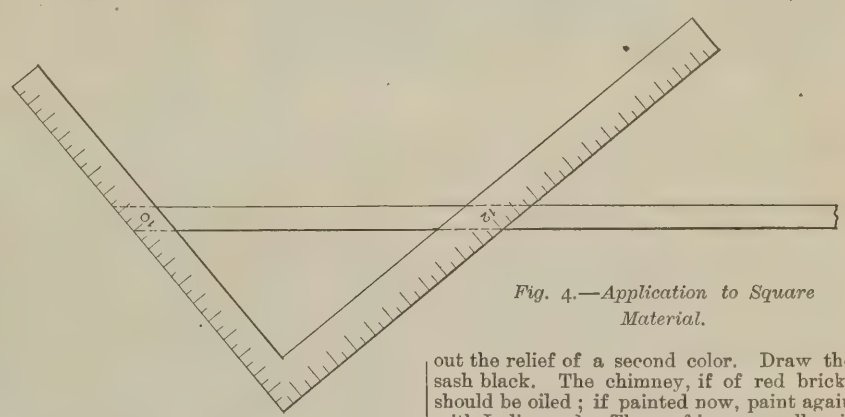


Fig. 4.—Application to Square Material.

We cannot well give our correspondent any advice about grading the lot with the meager description he has laid before us. We need to know the distance from the side lines of the lot to the house, and also which way the street slopes. It is also necessary to know whether the lot is a corner lot or an inside lot.

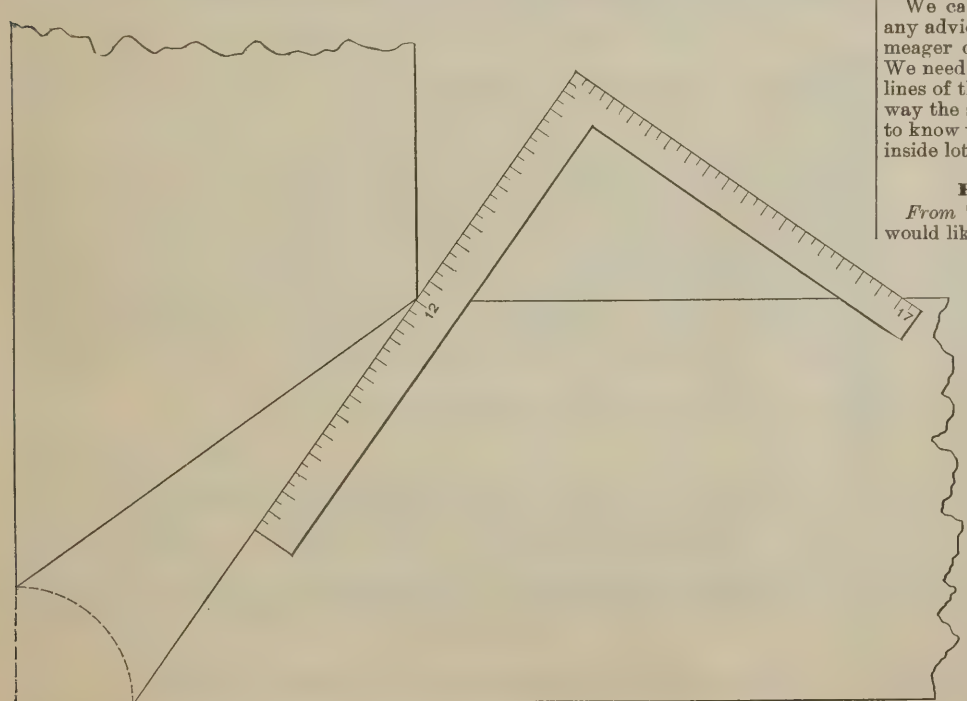


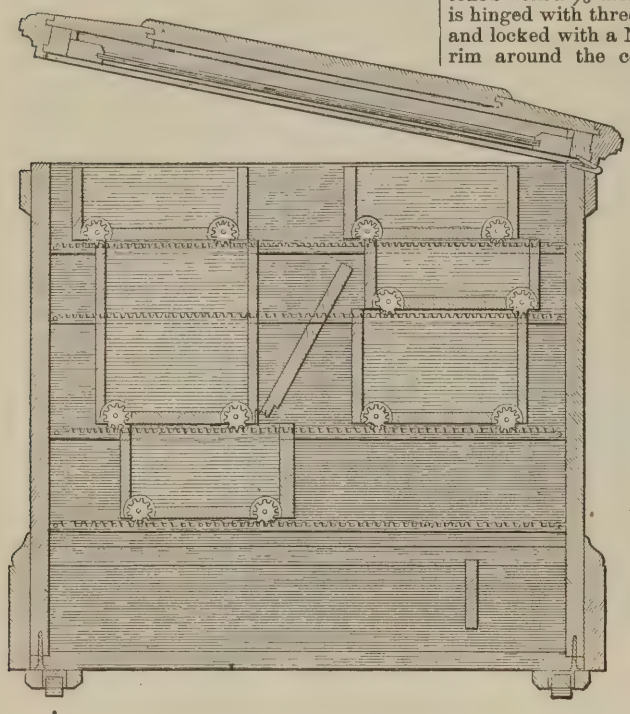
Fig. 2.—Application of the Square to the Face of the Work.

Patterns of Scrollwork.

From T. D. M., *Salt Lake City, Utah.*—I would like to learn, through the columns of the paper, where I can purchase patterns of scrollwork and designs of furniture that are not too elaborate for a carpenter and joiner to undertake.

Answer.—If our subscriber, in mentioning scrollwork, refers to such patterns as are frequently used in connection with amateur scroll-saws, and which in many cases are of the nature of fretwork, he can obtain designs in almost any required variety from manufacturers of the machines or from dealers. Many of the hardware stores keep such goods in stock or furnish them to order. If, on the other hand, he refers to general scrollwork, such as is sometimes used in house finishing and decoration, we hardly know what answer to make him. Most of the popular architectural books giving house plans present more or less details which are of the nature he requires, but they are for the most part to a very small scale and

would require enlargement and more or less adaptation in order to fit them for his purpose. Designs for furniture of a kind to be built by a carpenter and joiner of average ability are not very abundant. Now and then a design of this sort is produced, but for the most part such designs are so plain as to make them suffer by comparison with the goods that can be bought at reasonable prices from any cabinet-making establishment. We have published a number of designs of tables, cabinets, chairs, sideboards, &c., in the past, which come as near being of the kind our correspondent mentions as anything we know of. We are not aware of any publication being specially devoted to the interests about which he asks.



Design for Tool Chest, Submitted by J. M. J., Summit, Miss.—Fig 1. *Interior End Elevation.—Scale, 1½ Inches to the Foot.*

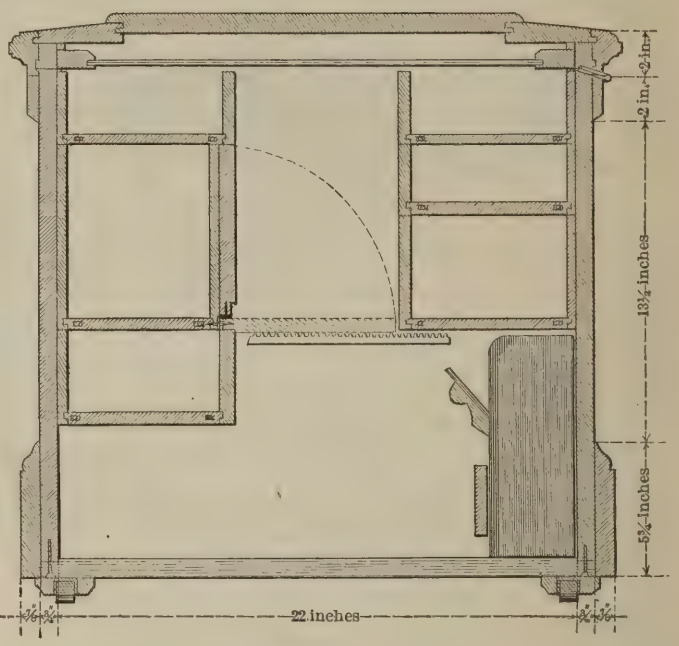


Fig. 2.—Vertical Cross-Section.—Scale, 1½ Inches to the Foot.

Design of Tool Chest.

From J. M. J., *Summit, Miss.*—In the January number of *Carpentry and Building* "F. L. M.," of West Winsted, Conn., asked for designs of tool chests. You answered his inquiry by referring him to back numbers of the journal. I made a chest for myself last summer which is original in design and may suit your correspondent, or at least prove of interest to other readers of the paper. Accordingly, I send you plans of the same herewith. One of the original features of the chest is the construction of the drawers, by which they are made to work free and easy. Each drawer rolls on four gear-wheels, which are made stationary in pairs, to wires passing through the bottoms of the drawers from end to end. The outside of the gear-wheels is flush with the ends of the drawers. The wheels and wires rolling together cause both ends of the drawer to move alike. The bottoms of the drawers are grooved on the edges, as shown in the drawings, deep enough to receive the wire axle. The groove is then filled up by gluing in a strip, leaving room for the wire to turn easily. The edges of the bottoms are made strong by driving ½-inch blind staples through the bottom, between the wire and the edge, 4 inches or 5 inches apart, and clinching them on the under side. The tongue on the edges of the bottom is then made. The sides of the drawers are put on first and the dovetailed ends are driven down afterward. The saw till will hold 10 saws, and has a lid hinged to it which can be let down to close the bottom of the chest or is held up against the saw till by a spring catch. The lid rests on the brass racks when down, and has flush drawer rings on both sides. Molding planes and large tools are kept in the bottom of the chest and small tools in the drawers. The square is fastened to the lid in the cover. The space in the cover is used to keep papers and drawings. The lid in the cover is hinged with three brass hinges and fastened with a ⅝-inch recess lock. The cover is hinged with three 2 x 3 inch brass hinges and locked with a No. 602 Miller lock. The rim around the cover is made strong by being halved together on the under side, showing a miter joint on top. The dovetails for the corners of the chest are original, showing alike on side and end, and leaving no holes on the inside to be corked up, as all other double dovetails do. The end of the board is split for 5 or 6 inches with a very fine saw, and is dovetailed as shown in the drawing. It is then opened by driving a wedge-shaped strip in the saw kerf. The end and side can then be driven together, after which the strip is taken out and the outside dovetails are driven together. If the joint is neatly made in this manner it will puzzle many to tell how the parts are got together. My chest is made of black walnut, with the exception of the bottom, which is of poplar, and the rim around the cover, which is of cherry. It is finished with Berry Bros.' hardwood finish.

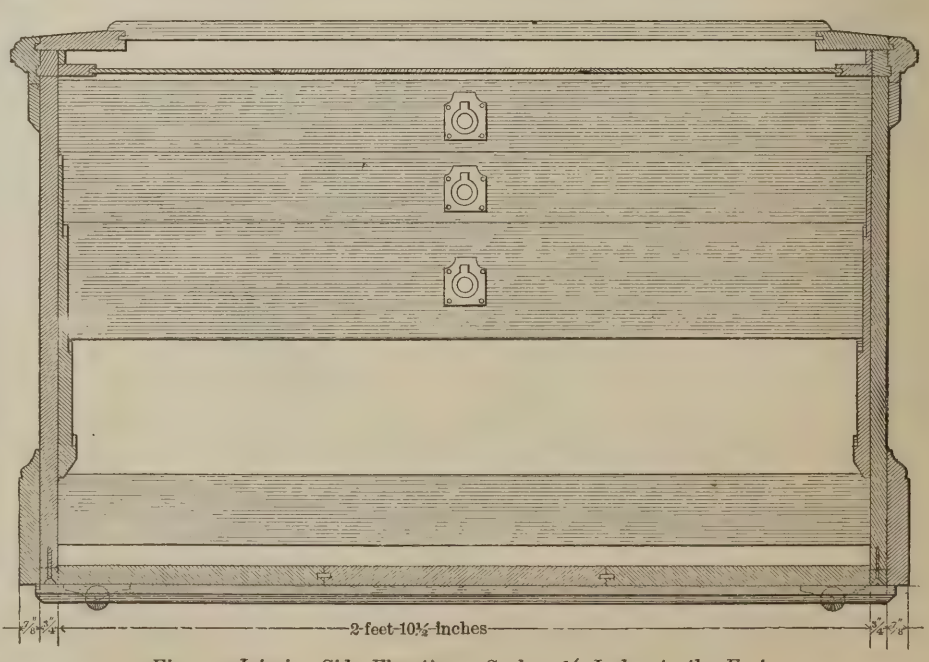


Fig. 3.—Interior Side Elevation.—Scale, 1½ Inches to the Foot.

Circular Bay Window.

From P. M. C., *Butte City, Mon. Ter.*—The following method of finding the lines for a planceer to a circular bay window will perhaps interest your Cambridge correspondent. The problem in question comes under the head of conic sections, or, stated otherwise, the planceer to a circular bay window would be the frustum of a half-cone whose base would equal the semicircle of a circular bay window plus two projections of the cornice. The length of the rafter would be the radius of the circle forming the outline, and the length of the arc would be equal to the semicircle of the circular bay window plus the two projections mentioned. The different parts may be notated and described as follows:

a = the circumference of a circle whose radius is equal to the length of the rafter.
b = the semicircle of a bay window plus two projections
c = 360°.
y = curve of circular sector or the length of the arc of the planceer. Then $y = \frac{bc}{a}$.

Plumbing Specifications.

From B. W. J., *Shirley, Mass.*—Please inform me if a plumber can collect pay for a specification he writes for a job of plumbing if he fails to obtain the contract, nothing being said about pay before it was written? I also desire to inquire to whom does the specification belong after the contract is finished?

Answer.—The right of a plumber or other contractor to recover for specifications furnished to another on his invitation and request, when the latter refuses to award the contract to the plumber, but retains the specifications and makes use of them, may at first sight seem a little doubtful. On the one hand, it might be urged that as the plumber was under no obligation to prepare the specifications, and the other party made no promise to pay for them, the work of the plumber was merely gratuitous, and his right to demand compensation depended upon his getting the contract. In reply it is admitted that the fact that there was an invitation of proposals or specifications for doing certain work does not in itself make the party asking for them liable to those that prepare them. If any one of them obtains the contract he will be paid, and the rest will not. They take their chances. The party inviting the proposals may, if he please, reject any or all of them. That is his right. He is not obliged to accept any one of them, even though the bid is the lowest and though it complies with all the conditions. This point was decided in People *ex rel.* Hackley against Croton Aqueduct Board, 49 Barbour, 259. The case of Topping *vs.* Swords, 1 E. D. Smith, has some resemblance to this question. In this case the owner of real estate, about to erect a building thereon, caused plans and specifications to be prepared, and then invited masons, carpenters, &c., to submit offers of the terms, prices, &c., at which they would perform the work. He said nothing about awarding the contract to the one who should offer to do the work at the lowest price. In the absence of any such promise on his part he was not obliged to do so. Such was the decision of the court. It was further decided that the owner was not liable to one whose offer was rejected for the time and labor employed by the latter in examining the plans and specifications in order to make the offer. Now, in both these cases it will be noticed that the offer was rejected; there were no specifications prepared by the party and furnished to the owner, and he derived no benefit from anything that was done. That is the test of his liability. No matter whether he formally rejects the offer or not. If he really accepts it, and make use of the specifications and derives benefits from them, he is liable.

The specifications may be of considerable value—the result of a certain amount of time and labor and skill. If the owner does not want them he should return them. The plumber has the right to demand them back. He owns the paper on which they are written, and he owns the ideas written on the paper. To say that either of these can be stolen by another with impunity is absurd. If we send a horse for inspection to a man who thinks of buying, he cannot retain the animal and use him and refuse to pay for him. He can, of course, decline to purchase. But he must do one thing or the other—he must either accept in toto or reject in toto. He cannot retain the benefit without paying the price. There is high authority for this proposition.

"Whenever a man has accepted and retains the benefit of work done for him, he is liable to pay a reasonable remuneration in respect thereof."—Addison on Contracts, page 578.

The case of Babcock against Raymond, 2 Hilton, 61, is precisely in point. That case decides that where a man who has made a proposal or invitation to others to furnish some particular article or offer of work, although he is at liberty to reject it if he please, yet if he does make use of it he is bound to make reasonable compensation. Mr. Raymond, the defendant, was the editor of the New York *Times*. He printed a paragraph in his paper, in which he invited the public to contribute articles on politics, and promised to publish those which he regarded as suitable. Mr. Babcock, the plaintiff, wrote an article in pursuance of this invitation, and sent it to the *Times*. The editor was at liberty to reject it if he wished. But he printed the article and then refused to pay for it.

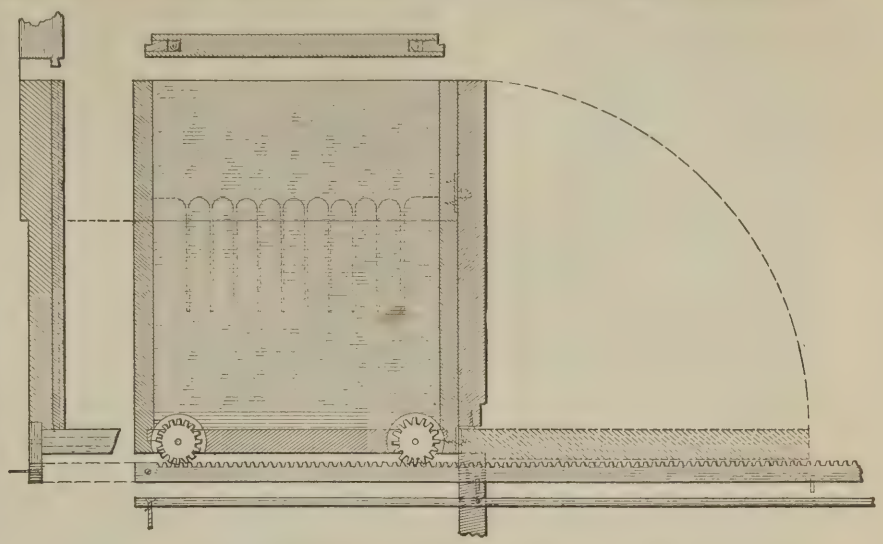
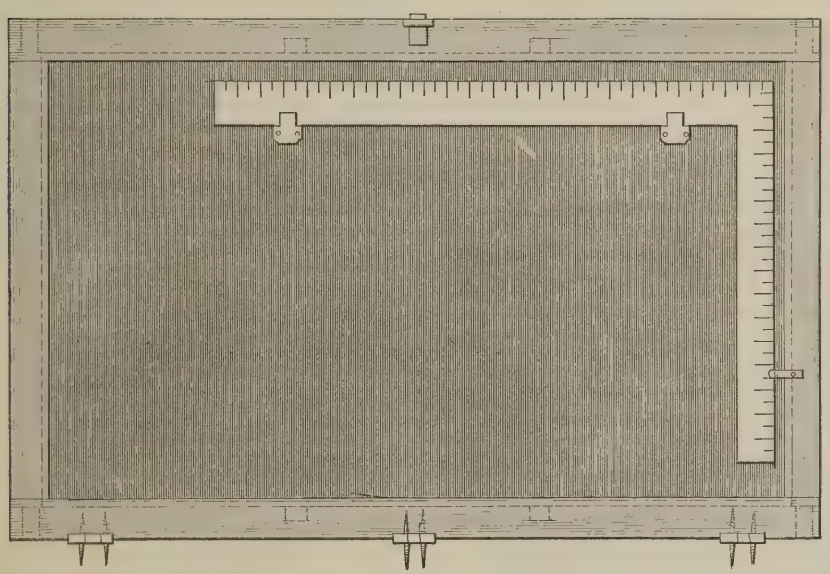


Fig. 6.—Detail of Rack and Pinion Movement of Drawers.



Design for a Tool Chest.—Fig. 4.—Inside of Lid, Showing Position of Square.—Scale, 1½ Inches to the Foot.

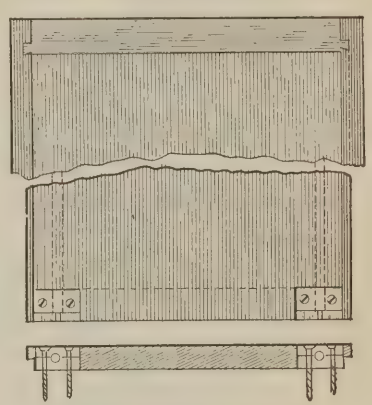


Fig. 7.—Construction of Drawers.

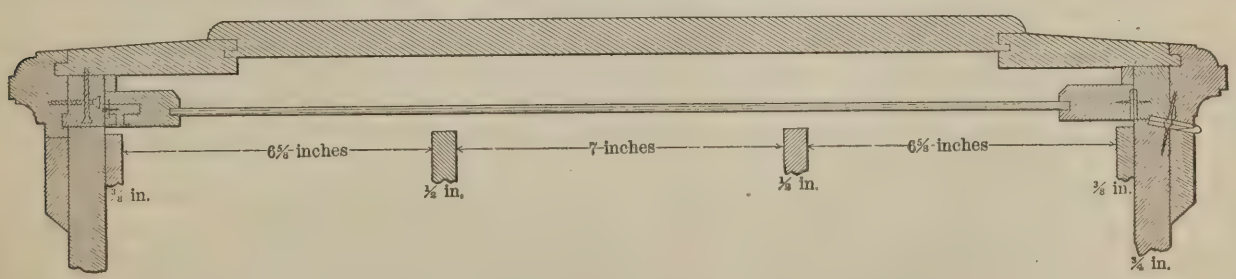
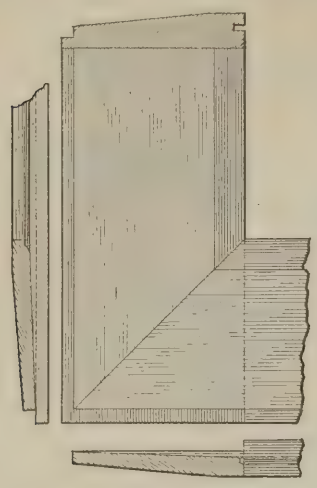


Fig. 5.—Cross-Section Through Upper Part of Chest, Showing Construction of Lid.—Scale, 3 Inches to the Foot.

The Court of Common Pleas held that he was bound to pay for it. The principle in the case and in the question proposed is identical. The facts are substantially the same,



Design for Tool Chest.—Fig. 8.—Detail of Frame of Lid.

and this decision would seem to put at rest any doubt which may have prevailed.

Photo-Engraving.

From J. S. W., *Huntsville, Ala.*—I desire to inquire if there is any plain, practical book published on the subject of photo-engraving. Would it be practicable for one not a professional engraver to prepare plates for printing on an ordinary printing press? I refer to maps and plans such as engineers use, and which they are in the habit of multiplying by the blue process. The engravings in *Carpentry and Building* are remarkably clear, and are invariably well printed. This causes me to write to you for information. I have Spon's "Workshop Receipts," second series, but there is so much stated in it in an indefinite way that I cannot make out anything practical. If there is no good book published on the subject of photo-engraving, would it not be an advantage to undertake a series of articles on this subject in *Carpentry and Building:*

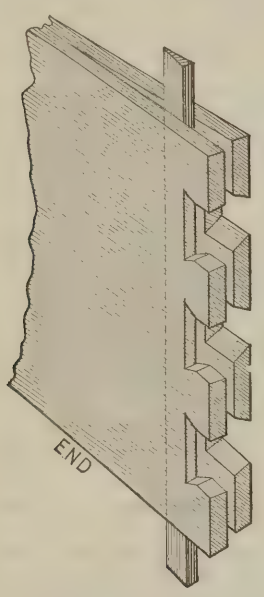


Fig. 9.—Splitting the End Pieces Preparatory to Making Corner Joints as Shown in Fig. 10.

Answer.—We do not know of any practical treatise on the subject of photo-engraving. The process is in many respects a new art, and in some of its features, at least, it is practiced with great secrecy. The general principles underlying the process of making relief plates by this process are well understood, and may be gained from various books of receipts, but their practical application, depending as it does upon numerous delicate chemical manipulations, is altogther another matter. We do not think it feasible for any one except an expert photo-engraver to prepare plates by this means. Besides, work of this kind can be obtained so reasonably at present that it is far cheaper to buy, under all ordinary circumstances, than to attempt to do the work in an amateurish sort of way We note with pleasure our correspondent's appreciation of the engravings published in *Carpentry and Building.* The elevations and details which appear in our issues from month to month are not done by the photo-engraving process, however; in fact, we use that process very little, as we require something better. Photo-engravings are commonly considered very cheap; on the other hand, when the cost of preparation of the original copy is taken into account, they become more expensive than cuts by various other methods that may be resorted to. At the same time other plans produce results which are often more satisfactory than plates made by photo-engraving. The plates in *Carpentry and Building* above referred to are actual engravings, although not woodcuts, and the clean lines upon which we pride ourselves are the result of skillful work upon the part of expert engravers, We use the photo-engraving process only for perspective views and work of this character, and for what little we use of it we probably pay more than average woodcuts would cost. Photo-engraving is cheap only when the engraving part of the work is considered. It is most advantageous for duplicating engravings already made. When combined with the cost of preparing the original copy, as mentioned above, it becomes quite expensive. Photo-engraving has the quality also of reproducing in the engraving all the imperfections of the copy, and accordingly in work of the character of details, where sharp lines and more or less lettering is required, it is not as desirable to use as would be supposed from a merely superficial consideration of the subject. We do not think an article on the subject of photo-engraving in our columns, other than one confined to general statements, as in the present case, is likely to be of value to our readers. Certainly, we could do them no good were we to make the effort to teach them photo-engraving.

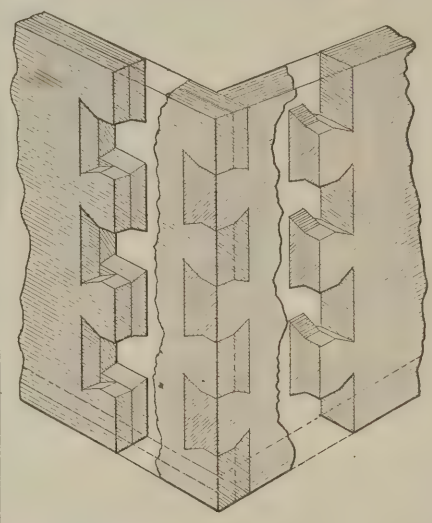


Fig. 10.—Peculiar Dovetail Used in the Corners.

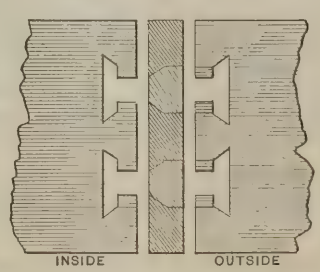


Fig. 11.—Manner of Cutting for the Dovetail on the Side Pieces.

Tool-Chest Handle.

From C. S. J., *Alexandre, Manitoba.*—Please inform me if there is a tool-chest handle in the market that will not drop out when a chest is up-ended. I have had several handles broken in transporting my chest by its being placed on end. If handles are made that are free form this objection I shall be very glad to procure some.

Answer.—Careful inquiry in the New York market fails to reveal an article of the kind our correspondent describes. We do not know that anything of the kind is made, although we should suppose it would be very saleable if it were once introduced.

Plastering on Sheeting.

From L. C. F., *Calliope, Iowa.*—In reply to "H. S. B.," of Spencer, Iowa, whose inquiry was published some time since, I would say that some of our best houses in this section are lathed on inside sheeting without furring, and that this construction gives good satisfaction. I recommend in such cases laying the lath at an angle of 45°, as this breaks joint with the sheeting and holds the plastering better than when they are put on vertically.

From W. M., *Middletown, Conn.*—Replying to the question of "H. S. B.," Spencer, Iowa, I would say that he can do good work if he will fur under the lath.

From G. T. E., East Saginaw, Mich.—In the January issue of *Carpentry and Building* "H. S. B." inquires with reference to lathing on sheeting without furring when the building is sheeted on the inside. He asks, Can good work be made in this manner? I would answer, Yes, certainly. Have the sheeting reasonably well seasoned and thoroughly nailed in place. Put the lath diagonally on the sheeting and have them also well nailed. I helped to put up some buildings in this way 10 years since, the walls of which are in good condition to this day. Plastering falls off sooner from spaces between studs than from the solid bearing on the studs.

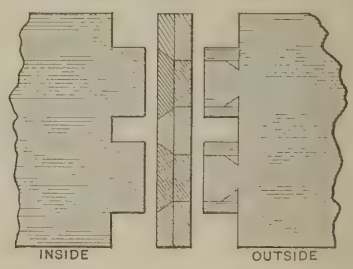


Fig. 12.—Manner of Cutting the End Pieces for the Dovetail.

From T. F. V., Marshfield, Wis.—Replying to the inquiry of "H. S. B.," of Spencer, Iowa, I would say that he would have the best job possible if he would lath directly upon the sheeting, without furring, and then plaster. One house in this city has the ceiling plastered in this way and the plastering adheres satisfactorily.

Fitting Doors.

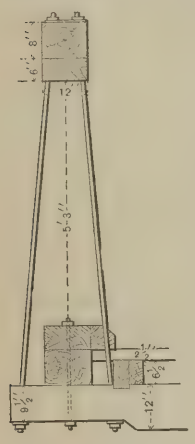
From F. A. K., *Westerly, R. I.*—In hanging doors in rebated jambs is it well to gauge the jambs the same distance as on the doors? I have heard the statement made that the jamb gauge should be set one-sixteenth less on the door. I can see no reason for the assertion unless the rebate is not worked out clean. I would be glad to have some practical reader of the paper give his opinion upon this matter.

Note.—If absolute accuracy were possible in woodwork, and if there was no such thing as thickness or body to paint or variation in sizes owing to shrinking and swelling of material, the two dimensions might be maintained the same. We think, on the other hand, that the allowance of one-sixteenth is only reasonable in view of the varying conditions which arise. We shall be glad to have our practical readers give their opinions upon this topic.

Trouble with a Leaky Roof.

From GEORGE C. W., *Tangerine, Fla.*—I have recently built a frame cottage having a shingle roof. The roof leaks about the dormers. Is it economy to paint the roof? Will the cements advertised by different roofing companies stop the leaks effectually? Which is the best patent roof for this climate?

Answer.—In the case of a new roof leaking in the way described by this correspondent, we should suppose the best remedy would be to correct the defect by relaying the roof in a workmanlike manner. There is no occasion for a shingle roof leaking about dormer windows or anywhere else if the shingles have been laid in a proper manner by an experienced man. Roofing paints and cements, in our estimation, are at the best but a makeshift when used for the purpose of stopping leaks, and other means to make roofs water-tight should be employed whenever possible. The best cements for such purposes are composed largely of paint skins, and, so far as we know, they answer a satisfactory purpose. While we would unhesitatingly employ them on old roofs that were practically beyond repair of any other kind, it does not seem the best thing to do with a new roof. On the subject of painting roofs architects and builders differ in their opinions. The practical results from painting depend in some measure upon the kind of shingles used, the exposure to which they are subjected and the manner in which the paint is applied. Perhaps the best plan of painting shingles is to dip them in paint bodily before they are applied, thus covering them all over. This plan, however, is objectionable unless the wood of the shingles be thoroughly seasoned. An objection to painting shingles after they are laid exists in the fact that the paint cannot be made to extend up under the shingles where they are lapped, but instead forms a sort of ridge below the overlapping shingles, which, catching a certain amount of wet, throws it up under the upper shingle, thus hastening decay at that point. Probably the question of painting a shingle roof after it is laid turns on the question of looks rather than durability. In reply to our correspondent's last question we would say that there are so many patent roofs, many of which we are not at all acquainted with, that it is hard to tell him which of the articles is best for the climate mentioned. We see no reason, however, why most of the roofs that are advertised might not be made to answer a satisfactory purpose. So far as we know, there are no peculiarities of Florida that would interfere with the satisfactory use of any of the roofs which give good results through the hot summer months in other portions of the country.



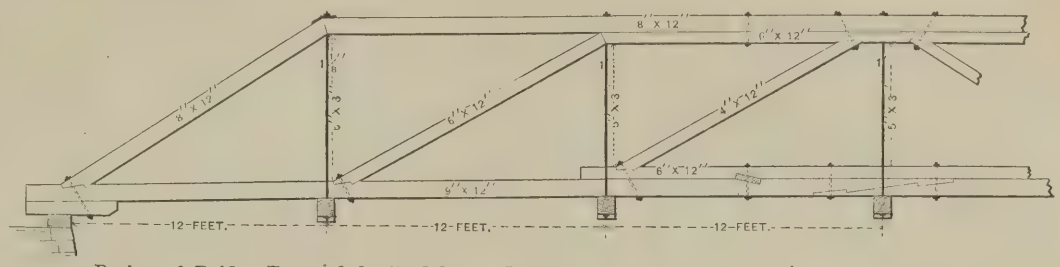
Cross-Section of Truss.—Scale, ¼ Inch to the Foot.

Storage of Power.

From B. G., *Pittston, Pa.*—I would say to "X. Y." that the best way to store power is by means of a steam boiler. Let him procure a small upright boiler engine for the purpose he describes. There are several of the kind mentioned in the market costing from $200 to $400. This amount of money invested judiciously in an engine would be entirely safe, and would accomplish all he has in view. Such an engine requires but little care, and the total expense of running it is a very small sum.

Design of Bridge Truss.

From E. P., *Hanover, Mich.*—I inclose a drawing of a highway bridge that I think will meet the requirements of the correspondent who some time since asked for bridge plans. I think the drawing shows the construction without explanation further than to say that the rods and plates should be provided with cast-iron washers of such shape that all the nuts will fit square with the bolts. The washers at the angles of the main braces and upper curves are made to take both rods and to extend over the joint sufficiently to hold the brace. The bridge shown is 72 feet span, or 75 feet extreme length. It has a roadway 14 feet wide. This on a much-traveled highway would be better 16 feet wide. The bridge should be constructed with about 6-inch spring. If oak timber is used in the construction of the bridge, the dimensions of the pieces may be somewhat reduced from what is shown on the drawing.



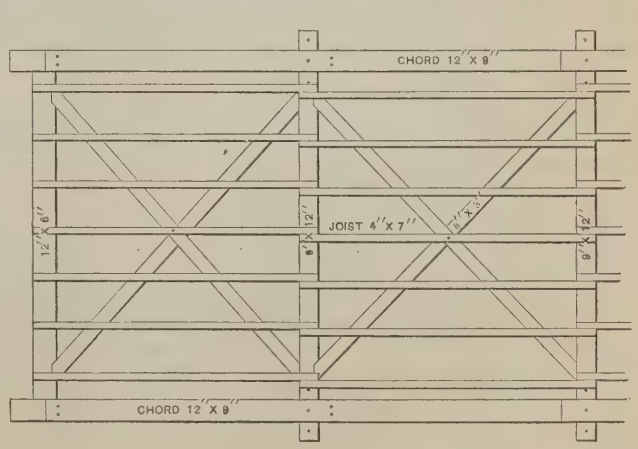
Design of Bridge Truss, Submitted by E. P.—Side Elevation.—Scale, ⅛ Inch to the Foot.

Aquaria Cement.

From J. L. E., *Memphis, Tenn.*—In looking over my *Carpentry and Building* scrap book a short time since I noticed several recipes for aquaria cement. I tried a dozen different recipes not long ago when I was making an aquarium, and accidentally discovered that by taking finely-ground litharge and mixing glycerine with it to the consistency of cream, then applying it to the corners of the aquarium allowing it to dry for a couple of days, I obtained a hard and waterproof cement. I merely place the edges of glass together, and make a firm joint in the manner I have described. The cement readily adheres to glass, wood, tin—in fact, to almost any material.

Supporting Floors.

From J. D. B., *Orangeville, Ohio.*—I submit the following method of supporting floors in reply to "J. M. J.," of Summit, Miss.: I have supported floors of 30 feet span on 2 x 12 joists by cutting in three rows of trimmers the same width of joists, making four equal spaces across the building. I ran a ¾-inch round rod of iron lengthwise opposite each row of trimmers, placing it 1 inch from the lower edge of joist, and extending it the whole length of building. Each of these rods was provided with a good nut and washer at each end, so arranged as to be turned up as tight as required. In long spans I set joists 12 inches from centers, and size the joists to thickness where the trimmers come. The iron rods need not be the whole length of the building in one piece, but may be in lengths of 20 feet and spliced together by putting the nut on both sides of the joists where they meet. I have supported a number of floors in this way, and the plan works to a charm in every case.



Framing of Floor.—Scale, ⅛ Inch to the Foot.

Painting.

From I. T. T., *Walden, Mass.*—In answer to the inquiry of "S. A. M.," Texas., I would say that boiled oil ought to dry without the addition of dryers—that is, provided the work to which it is applied is not smoky or greasy. Some painters, however, prefer to use raw oil and liquid dryer, as the paint will be harder and there will generally result a better job. For nice inside work we generally use seven-eighths turpentine and one-eighth oil. We use less oil for white paint. If a very small portion of white liquid dryer is used it will hasten the drying.

REFERRED TO OUR READERS.

Putting in New Sills.

From J. C. B., *Hickory Corners, Mich.*—I have a building 16 feet wide, 36 feet long, with 10 foot posts, balloon frame construction, the sills of which were laid on the ground when it was built and are now nearly rotted through. I wish to jack it up, put in new sills which shall lay level and plumb on the stone wall to be built while the building is raised. Will some practical man among the subscribers of *Carpentry and Building* give me some ideas of how to go to work to accomplish this work, and how to save the building from warping while this is being done?

Cistern Plastering.

From W. S. S., *Princess Anne, Md.*—Will some practical reader of *Carpentry and Building* advise me as to the best cement for brickwork in building cisterns and for finishing the inside of cisterns?

Building Association Problem.

From L. F. U., *Pa.*—Since many of the readers of *Carpentry and Building* are mathematicians, judging by the discussion of certain problems which have recently been published, and as many of them no doubt are also interested in building associations, I submit the following problem for consideration:

A certain building association loaned the sum of $1000, on the condition that it should be repaid in 20 monthly installments of $60 each, commencing one month after date, the excess being the charge for interest. What monthly rate of interest did the person pay who borrowed the money? I

shall be glad to see this problem answered, with thorough analysis.

Framing of a Flat Roof.

From J. E. A., *Wartsbury, Wash. Ter.*—Will some practical reader of *Carpentry and Building* suggest a plan for constructing a truss roof for a span of 60 to 100 feet. The roof I desire is to be as flat as possible. The timber used will be red fir, the roof covering will be tin or felt.

Small Cottages.

From F. S., *Cincinnati, Ohio.*—If some of the readers of *Carpentry and Building* would contribute to its columns plans for three and four room cottages suitable for men who labor, they would make the paper still more valuable to a certain class than it is at present. People who desire houses of this kind are unable to pay the commissions of an architect, and very frequently when trusting the work to a local builder fail to get the best for their money. A few plans for very cheap houses would be of value to many readers of the paper.

Plan of a Conservatory.

From R. B. MacD., *Titusville, Pa.*—Will some of the architectural contributors to *Carpentry and Building* kindly furnish a plan for a conservatory. I want something that is neat in appearance, well arranged and suitable for construction in connection with a house of ordinary appointments.

Stone Mullions.

From C. R. B., *Moorecombe, England.*—An acquaintance asked me some time since, "Why will not Americans put stone mullions in their churches? The lack of them makes their buildings look very mean. I know of but one church in the States that has them." In reply I was able to remind my friend of several in Canada, but the question still is an interesting one, and I submit it to the readers of *Carpentry and Building.*

Cleaning Woodwork.

From T. W., *Clymer, Pa.*—I desire to ask the readers of *Carpentry and Building* whose duty it is to clean woodwork ready for painting after the plasterers are through? Is it the plasterer's business, or does it belong to the painter, or is it possible that it belongs to neither of them in case it has not been mentioned in either of the contracts?

Drug-Store Fittings.

From R. B. MacD., *Titusville, Pa.*—I shall be glad to see published in *Carpentry and Building* samples of shelving for a drug store. The presentation of plans of this kind will be of value to many of your readers.

TRADE NOTES.

We are in receipt of a copy of the new catalogue issued by the Indianapolis Terra Cotta Company, Indianapolis, Ind. It is a large oblong book, made of paper the color of which might be described as "terra-cotta" red, on which the designs appear in black. In size, style and other general features the volumes of some of the older firms in this line of trade have been followed, notwithstanding the fact that the cumbersome shape effected by them gave fine opportunity for a display of originality by a young and enterprising concern. The book contains 10 plates, the designs in which are drawn to scale 1 inch to the foot. The articles shown embrace crestings, finials, chimney pots, diaper tile, belt courses, panels, &c. The designs are well drawn, and the cover is unusually appropriate. A sketch which is worked into the general design traces the history of terra-cotta from the earliest times down to its modern employment as a decorative material, and is well done.

The Square Hole Auger Company, of Wooster, Ohio, have experienced delay in getting their boring machines on the market, owing to longer time required to build the special machinery necessary to the proper construction of the article than was anticipated at the outset. They have issued a circular from which we take the following: "The cutter-heads are of a peculiar shape, and the other parts of the stock must be adjusted to it. The cutter-heads in the complete machines heretofore manufactured by us were chiefly hand-made, and, however well done this work may be, we find that these parts were not interchangeable in different machines. We therefore feared that, if at any time repairs were needed, the purchaser of a machine at a distance from our works would be unable to adjust a new part to his machine. To obviate this difficulty we determined to make each and every piece in one machine a duplicate of a similar piece in every other machine. To do this we found that we could not rely upon handwork in making the cams or cutter-heads, and that steel dies and drop forging only could give us interchangeable parts where accuracy was most necessary. All this has required time and patient work, but we know that we thereby avoid annoyance and dissatisfaction to ourselves and our customers. Having adopted this change, we were assured that we would be able to begin to fill the orders of our customers by the 1st of this month, but we find that more time has been required to perfect machinery."

The American Bangor Slate Company in another column of this issue direct attention to their superior product of black roofing slate. The low prices of slate at the present time should insure their use in many cases where higher figures have prevented their employment in the past. Of the various grades of slate on the market none have achieved a more desirable reputation than the Pennsylvania black slate which this firm produce.

The Van Dorn Iron Works, Cleveland, Ohio, manufacture a general line of builders' and contractors' ironwork, including iron fencing, railings, crestings, stable fixtures, lawn ornaments and jailwork. In their card, which appears in another column, they invite the trade to send for copies of their catalogues, a brief review of which we published last month.

We have received a copy of the new edition of the pamphlet put out by the American Well Works, Aurora, Ill. It contains nearly 100 pages and is profusely illustrated with cuts showing various kinds of tools and appliances used in putting down modern wells. The book also contains illustrations of pumps, windmills, tanks, &c., and various accessories employed in the business described. The pamphlet is of value to all who have wellwork to do.

The Raymond Furnace and Mfg. Co., 76 Beekman street, New York, in inviting the building fraternity at large to send plans for estimates upon steam, hot-water and warm-air heating, offer a kind of help that will be appreciated by a very large class among our readers. They manufacture, in addition to other specialties, the famous open stove known as the "Fire-on-the-Hearth." Their assortment of goods of interest to the builder includes also portable and brick-set ranges, schoolroom heaters, &c.

Messrs. Grygla & Selden, roofers and manufacturers of architectural sheet-metal work, Minneapolis, Minn., send us a copy of their new catalogue. It is a pamphlet of 128 pages, and contains many engravings of prominent buildings upon which their work has been placed, and of designs of individual parts, including cornices, window trimmings and other details. The pamphlet will prove a desirable book of reference for both architects and builders, wherever situated.

We have received from P. Pryibil, No. 461 West Fortieth street, a photogravure print illustrating the twists produced on a special machine built by him. No less than 12 different samples are shown, which were photographed just as left by the machine without sand-papering. Rope moldings, which is another name by which articles of this kind are sometimes designated, are very popular in some styles of architecture and in some kinds of decoration. Accordingly, a machine that will produce them satisfactorily is a very desirable addition to wood-working establishments. The articles shown in the print are unusually fine in character, and illustrate in a marked manner the capacity and accuracy of the machine which Mr. Pryibil builds. We understand these prints are sent to all applicants.

The new retail store of Messrs. Fr. Beck & Co., the well-known manufacturers and importers of fine wall papers and makers of that interesting material Lincrusta-Walton, is situated on the southeast corner of Fifth Avenue and Thirtieth street, New York. Messrs. J. C. Cady & Co., architects, had charge of the reconstruction of the building, which had been previously a private dwelling. The interior of the store is a revelation of the possibilities of Lincrusta-Walton for decorative purposes. The room is 80 feet in length and 20 feet high. The ceiling is done in Lincrusta-Walton and is of a Moorish-Arabesque character. The cornice is double and below it is a frieze of floral scrollwork separated from the frieze proper of the wall by a broad mold line of burnished gold. Below the frieze comes the dado, a foot in breadth, and then the body of the wall, which is in Lincrusta-Walton of the color of oak. The fireplace of iron contains two immense dogs of hammered iron, quaint in construction and artistic in design. Handsome pieces of old tapestry, and mirrors judiciously arranged, add to the beauty of the interior. At the rear of the store are two smaller rooms, one of which is Moorish in style, with a coped ceiling of Arabesque stucco work in Lincrusta-Walton. The upper stories of the building, decorated in the same material, will be used as apartments, Messrs. Beck & Co., retaining the ground floor and basement for business purposes. At intervals in the main room are arranged stands and screens containing either Lincrusta-Walton samples or specimens of the newest and finest wall papers imported by the firm or manufactured by them. The new branch has been placed in the charge of Mr. N. B. Farrar, who has had much previous experience in matters of this kind, The decorations of this branch store, as well as the extensive stock carried there, afford an excellent opportunity for any who wish to advise themselves concerning Lincrusta-Walton as a material for interior decoration.

We have received from the Raritan Hollow and Porous Brick Company, whose factory is on the Raritan River, 2 miles above Perth Amboy, N. J., a very neat book devoted to fire-proof building materials, of which this company make a specialty. The general office of the company is at 115 Broadway, New York City. We noticed a former edition of this work several months since The specialties shown consist of hollow burnt-clay bricks for flat arches, between iron beams, and for partitions, furring, roof lining, column fire-proofing, floor deafening, &c. This book is handsomely bound in cloth, with gilt side title, and is a very interesting addition to the trade publications collected by architects and builders. The present volume contains all that was presented in the former work, with several important additions. The work serves not only as an advertisement of the company, but is also a sort of text book on fire-proof construction.

The Hinckley & Egery Iron Company, Bangor, Me., send us circulars of their gang lath mill and their gang lath and bolter mill, also of their automatic box board machine, the Dirigo shingle machine, Richardson's parallel double-edger, Davis's clapboard machine and a rotary bed planer. These machines are apparently well designed and seem well calculated for the work they are intended to perform.

Messrs. Boyle & Co., No. 419 Walnut street, Philadelphia, who designate themselves as slate merchants, announce, in addition to roofing slate, several items of material frequently of the greatest importance to engineers, contractors and builders, and which are often somewhat difficult to obtain through the usual channels of trade. Among them may be mentioned machinery foundations, slabs for vats, tanks and large hearths also sills, caps, lintels and stairwork.

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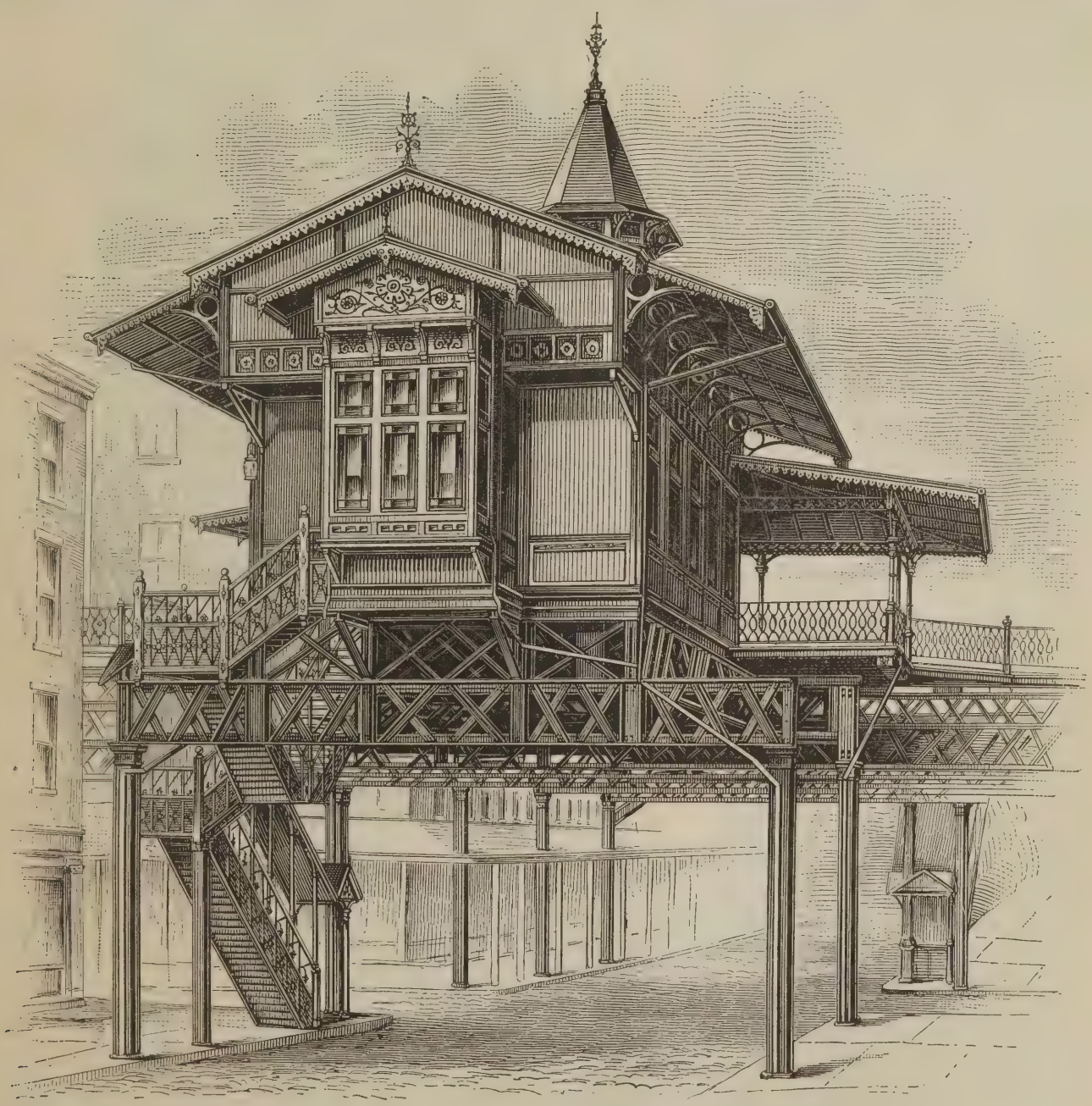
Iron in Architecture.

In previous articles on this general subject which have appeared in our columns within a few months past we gave attention to the development of iron architecture as employed in city buildings, and also considered some of the peculiar features, both of construction and of design, which have entered into recent work. As we have heretofore intimated, the field is a very broad one, and to cover it thoroughly would demand a large volume rather than a few detached newspaper articles. At the present time we desire to refer somewhat briefly to several peculiarities in ironwork as constructed to meet some of the particular needs of the metropolis. The examples to which we shall direct attention are not of the most recent work, and perhaps are not the most striking that might have been selected for our purpose. Some of them are already familiar to many of our readers, and by reason of their every-day use attract less attention than they would otherwise. They are, in fact, not exceptional examples, but rather types of classes that are in such general employment that they are less heeded than if they occurred only once and were of less general utility.



STATION OF THE ELEVATED RAILROAD, NINTH AVENUE LINE, NEW YORK.

Our first illustration shows one of the stations of the elevated railroad system of New York. It is entitled to consideration not only on account of the novelty of the design and the peculiar conditions under which the buildings which it represents were erected, but also an account of the general utility which they have been proven by several years' practical use to possess. The stations of the elevated roads in New York have been variously described in the past, notably immediately after the roads were first opened, and accordingly there is little that we can say about them, in a general way at least, that would not be a virtual repetition of what many of our readers have already seen. It is one thing, however, to describe a structure on account of its novelty when first erected, and another to describe it as exhibiting features of design and a kind of construction which have served a useful purpose, and which illustrate useful applications of a peculiar material. The general system of elevated railroads is ex-

tending, and a new road has been opened quite recently in Brooklyn, where the experience of some of the older systems was considered not only in designing the stations, but also in other features. The fact that in their principal elements the stations of the Brooklyn road resemble some of those in use upon the older roads in New York is conclusive evidence that the ideas of the designers at the outset were not far from right. The Brooklyn buildings are smaller and far less elaborate than those used in New York, and in many instances they are not so distinctively iron buildings.

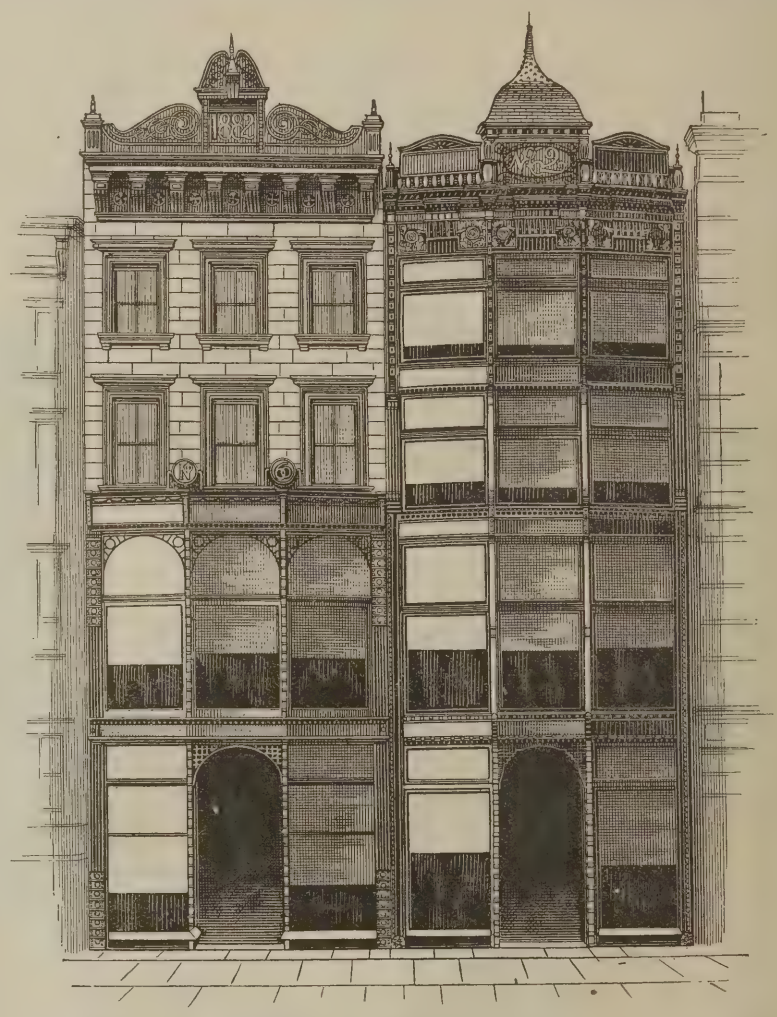
The engraving shows a building that is as nearly all iron, perhaps, as it is possible to make a structure at the present time within the bounds of reasonable cost. Its foundations, as may be seen by the cut, are iron columns carrying trusses upon which the building rests. The trusswork in character is not unlike the trusswork of the railway, portions of which are also shown in the cut. The floor, inside finish and sheeting of the roof are of wood. The outside finish, however, is of metal, and corrugated sheet iron is a very prominent feature of the construction and decoration employed. The style of the building is one not only appropriate to its position and satisfactory for the general purpose for which it was erected, but is also one that uses the materials employed in its construction to good advantage. It may be profitably studied by those who desire to use sheet metal work constructively or decoratively as affording a practical example of what works well and looks well. The general framework of the building to which the metal is attached is of iron; the projecting eaves covering the stairways are carried on iron brackets, while the ornamentation along the gables and in other portions is of sheet iron. We might occupy considerable space and go more thoroughly into the details of this building, but enough has been presented to illustrate the general point we desire to make, namely, that there are styles in architecture peculiarly adapted to wrought and sheet iron as a building material as well as cast iron, and that the careful designer of any building in which these forms of the material are to be used need have no difficulty in finding assistance in his structures in the way of model buildings already completed which may be studied. Wrought iron and sheet iron have styles and forms appropriate to themselves, and they are as unlike those of cast iron as they are unlike wood, stone or brick.

Our second illustration shows two buildings on West Twenty-third street, near Sixth avenue, and illustrates another need of the city which iron as a constructive and decorative material has supplied. The building shown on the right, if we mistake not, was especially designed and built for the purpose for which it is used, but the one on the left illustrates how a four-story brown-stone front of the conventional type is often altered to meet the demands of modern trade and manufacture. The striking features about these buildings are the small amount of iron used in the front and the large amount of light that is secured. Practically an entire glass front is obtained. The stores, on entering them, are found to be excellently lighted. The large amount of glass used answers a useful purpose, not only in affording light to the rooms, but also in displaying goods after the usual manner in show windows. Both fronts are slightly bowed.

Altering over old buildings and adapting them for stores is something that is constantly going on in various localities in New York. No two portions of the city probably exhibit more interesting work of this kind than Fourteenth street and Twenty-third street. How this is very often performed is clearly illustrated in the building on the left, already referred to. The upper portion of the front would be supported by heavy timbers put in place for the purpose, while the lower part was taken out and a truss inserted reaching from side wall to side wall. Then the front, consisting of iron columns and plate-glass windows, would be inserted, the whole resulting in about what is shown in our engraving. Hundreds of reconstructed buildings of this general kind can be found in the city, and such alterations have become a distinct branch of trade. Occasionally an ambitious sign block or some other decoration is put above the main cornice, as in this case. In other instances no attempt at embellishing the building is made save only so far as painting and finishing the front.

If the architectural design of the building shown on the right of the engraving were to be closely scrutinized, many features would doubtless be found open to criticism. Capitals are employed and forms of columns are used which we are safe in saying are not ordinarily laid down in books. A large amount of nondescript ornamentation is introduced, not only in the individual members of the lower portion, but also in the cornice and the structures which surmount it. Added to this, the painting, including some gilding, has given the whole a somewhat gaudy appearance, which, while making it conspicuous on the street, would no doubt offend conservative art tastes. Aside from mere considerations of taste, however, the building answers a very excellent purpose and thoroughly fulfills the requirements laid down by those for whom it was erected. Iron plays an important part in the construction, and is as serviceable here as in many other instances. We do not intimate by any means that a building less offensive to refined taste might not be equally successful for the purpose. Quite the contrary. But the better building would probably use iron in the same general way as this, although the forms in which it would be worked would be different.

Our third engraving shows an iron front put up a few years since in West Fourteenth street, New York, and which, while it has many of the features common to the ordinary run of iron buildings, shows one thing in a conspicuous manner that deserves special attention. We allude to the entrance-way and the space that has thus been obtained both for the admission of light and the display of goods. The floor of the entrance-way is made of illuminated tile, thus affording light for the basement. The doors entering the salesroom are located well back from the front, causing the visitor to pass by many attractive displays of goods before entering the store. The weight of the front is carried by columns built inside of the projecting show windows shown at either side of the arched entrance-way. A truss spans the space over the arch and carries the central weight of the front. Light openwork finishes the spandrels of the arch, and is also introduced in the panels below the show windows. Other successful efforts to secure a maximum of light and space about an entrance-way to a store building might be cited in this connection, all of which depend upon the use of ironwork. What we have shown is perhaps as conspicuous as any that could be presented, and illustrates in a marked manner the usefulness of iron as a building material for accomplishing ends which would be both expensive and difficult to secure with any other material. Nearly, if not quite, as much light is secured to the various floors of this building as in that shown upon the opposite page, already described, but the architecture is of a less pronounced type, and the building as a whole is one which would escape many of the criticisms that could be applied to the other.



Iron in Architecture.—Buildings at Nos. 60 and 62 West 23d Street, New York.

NOTES AND COMMENTS.

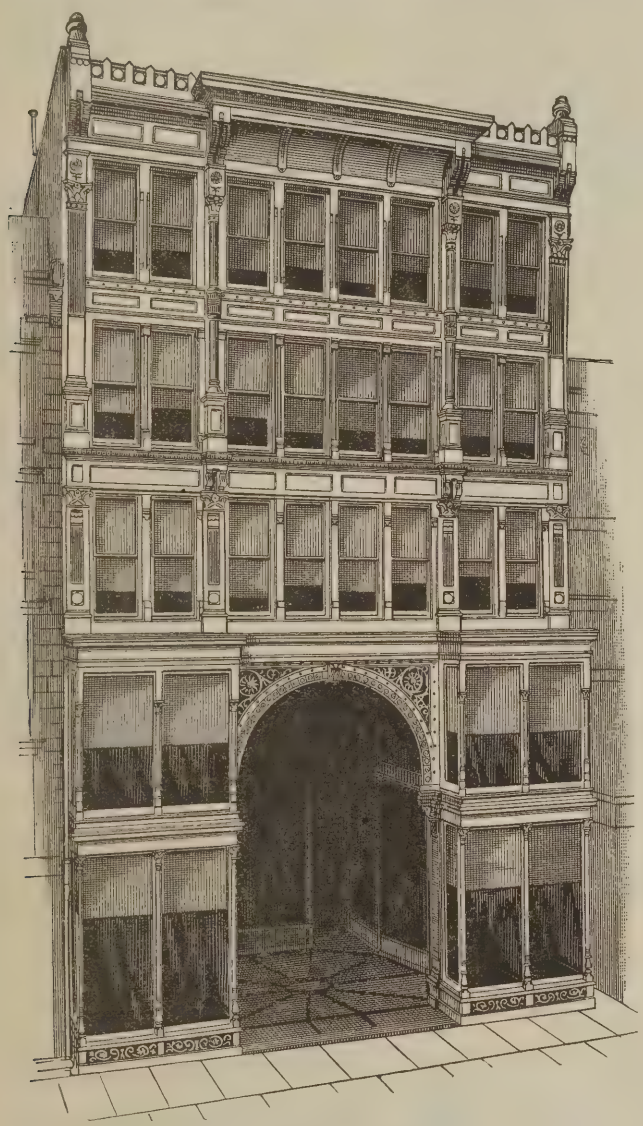
We are constantly called upon to give particulars concerning the conditions under which we receive plans for publication in *Carpentry and Building*. One subscriber writes to know whether the plans must be drawn to a given scale or upon some certain kind of paper. Another desires to know what fixed conditions prevail with reference to the details. We answer a great many such questions by mail, but perhaps some general particulars laid before our readers may be the means of anticipating—in part, at least—such inquiries for the future. There are no established conditions with reference to matters of this kind. We are glad to receive plans for examina-

tion from any source and in almost any condition that they may be prepared. We seldom reproduce anything directly from the original drawings, preferring for the most part to make actual engravings. Accordingly, the scale of the drawings, the kind of paper, color of ink and other similar particulars are of very little importance to us. What we desire are meritorious designs, clearly expressed and so well done as to leave our engravers in no doubt as to the artist's real meaning in any particular. Every set of drawings received is promptly acknowledged, and those we are unable to use for any reason are returned.

The ninth volume of the Tenth Census Report is devoted to American forests and shows the distribution of forest timber and the lumber field as it existed in 1880. It also gives many interesting particulars concerning the manufactures employed in working up wood, and compares the different forest States. It would be impossible in a brief mention of this volume to give many particulars which are of undoubted interest to our readers. We can only epitomize in the briefest possible manner. Michigan is the greatest lumber-producing State in the Union. The value of the products of Michigan, Wisconsin and Minnesota is more than one-third of the production of the entire country. The extinction of the forests of the lake region, which will occur at no very distant date, it is believed, would seriously affect the growth of population in the central portion of the continent. The country between the Mississippi River and the Rocky Mountains is now largely supplied with lumber from this region, and after a time will be compelled to depend upon the more remote pine forests of the Gulf region or those of the Pacific Coast. We learn from this volume that the forests of the United States are, in spite of reckless management, capable of yielding for many years to come a larger amount than has yet been drawn from them. While New England and New Jersey have been stripped of pine, there is a vigorous new growth coming forward. There are numerous tracts of forests in the South-Atlantic region yet uncut, although Southern pine will not take the place of the white pine of the North.

One of the most important portions of the report contained in this volume is that relating to the danger of wasteful methods of lumbering. Two causes are shown to be constantly at work destroying the permanence of forests and threatening their total extermination as sources of national prosperity. These are fire and browsing animals, which inflict greater permanent injury than the axe, recklessly and wastefully as this has generally been used against them. It is estimated that during the census year over 10,000,000 acres were burned with a loss of nearly $30,000,000. The volume throughout abounds with many particulars that are of the greatest importance to the lumber interests. It is to be regretted, however, that so valuable a work as this should be so long in preparation. The statistics given are at best somewhat unreliable, in view of five years' active industries which have succeeded the time to which they relate.

On this and the two previous pages we present engravings of some characteristic iron buildings, with very brief description. The article referred to and others on the same general subject which have preceded it serve to call attention to some of the peculiarities in the modern use of iron in architecture. In this connection the remarks of a contemporary on the same topic are of interest: The increased use of iron in building operations, besides raising important questions relating to the safety of the structure in case of fire or of unusual strain from other causes, has directed attention to the proper ornamentation of the ironwork itself. Ruskin, who is just as remarkable for his inability to grasp a whole truth as for the keenness with which he sees a half-truth and the skill with which he presents it, has declared, in his dogmatic way, that "true architecture does not admit of iron as a constructive material." Even if this were true, it would still be worth while to try improvements in iron ornamentation, for iron in edifices has come to stay, and, whether true architecture admits it or not, many business houses are sure to be built with iron as the chief structural material. A paper read by G. Richards Julian before an English engineering society, a short time ago, throws such light as indicates the direction wherein cast iron may be ornamented with fidelity to art principles. The subject seems to be a new one in England, though some advances have already been made in this country toward an artistic treatment of the ironwork of buildings.



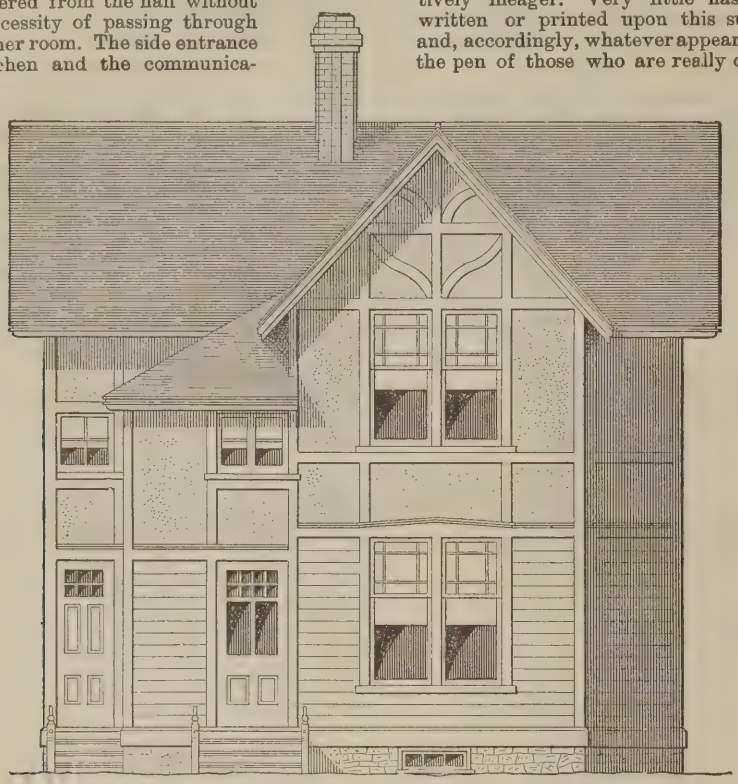
Iron in Architecture.—An Iron Building in West Fourteenth Street, New York.

It is one of the canons of art that whatever is false should be avoided; that works to be beautiful must be truthful; that wood must not represent stone, nor cast iron imitate wrought iron or stone. This general principle was naturally violated when cast iron was introduced as a building material. It took the place of other materials, and an effort was made to stimulate those materials. Cast-iron columns were made in the form of stone columns, with richly-foliated capitals heavily undercut in a manner not suitable to the material of which they were made. The proportions which had been found suitable for stone could not be maintained with iron. A massive stone column was replaced by a slender iron pillar, much longer in proportion to diameter than would have been allowable in stone. Building with fronts constructed of cast iron in servile imitation of wood or stone violated the principle of art relating to imitations, and were, moreover, so opposed to the principles of proportion which the older structures had impressed upon the mind that critics like Ruskin naturally protested against them.

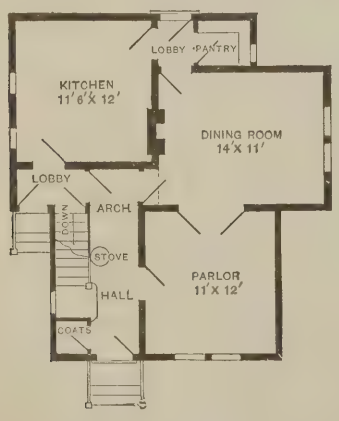
But it is not, therefore, necessary to condemn cast iron as inherently inartistic and unsuitable for use in "true architecture." The problem presented to architects is to find new designs for the proper use of iron with due respect to the qualities of the material. They must abandon tradition and develop an architecture in iron, as the Grecian architects developed one in stone. This has been already done to some extent, and the airy lightness of iron buildings is beginning to be as much appreciated as the massive strength of structures in stone. Mr. Julian, in his paper, points out some of the ways in which iron may be ornamented without imitation of other materials. It is unnecessary to follow him in this, for examples are already to be seen in many of our new iron-fronted storehouses. Round, fluted columns, with Corinthian capitals imitating stonework, have been displaced by columns of a variety of cross-sections, and the capitals are replaced by bracket forms suited to the material and wholly unlike anything permissible in stone. The surface decoration of panels has also undergone a change, which distinctly recognizes the nature of the material. It is low in relief, with sharp outlines, and conventional in form. This treatment of iron is in the right direction and will soon give us an iron architecture distinct from stone or other materials and as truly artistic. Utility and adaptation of means to ends lie at the base of all good design and decoration. When iron is structurally treated to give adequate strength with lightness, and the ornamentation required by cultivated people is strictly subordinated to utility and the nature of the material, we shall have done with offensive imitations and the architecture of iron will be as "true" as that of stone.

Inexpensive Frame Houses.

The special points of merit in the design submitted herewith, which was prepared for us by Mr. F. Bartlett, Napanee, Ontario, are presented by the author as follows: All the rooms on the ground floor may be entered from the hall without the necessity of passing through any other room. The side entrance to kitchen and the communication with the cellar are points of convenience, admitting the stores to be taken to the cellar without the necessity of passing through the kitchen. The arrangement is such also as to make it possible to reach the back yard without the necessity of passing through the kitchen. The pantry lobby is so located with reference to both dining-room and kitchen as to form an indirect passage between these two rooms. The pantry is also so located as to be away from the heat of the kitchen and dining-room. The author also directs attention to the convenience of the coat-room, the position of stair window—both lighting and giving effect to the hall—the small amount of space occupied by the hall door, and the side entrance to kitchen and to cellar He also directs attention to the relative position of parlor and dining-room as being desirable. The advantages of the arrangement of the second floor may also be briefly recited. There is a very small amount of space consumed in the hall, and there is space ror a flower-stand at the head of the stairs. The size and shape of the bedrooms fender them convenient, and a child's bedroom opening into the family-room is provided. It may be heated by a pipe from the hall stove. Each bedroom is provided with a closet. The exterior finish is a combination of woodwork and plaster. Mr. Bartlett estimates the cost of this building at about $800.



Inexpensive Frame House.—Front Elevation.—Scale, ⅛ Inch to the Foot.—F. Bartlett, Napanee, Ontario, Architect.

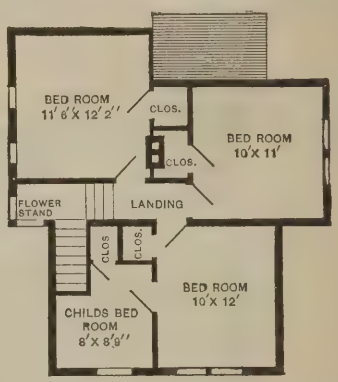


First Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

Bricklaying.

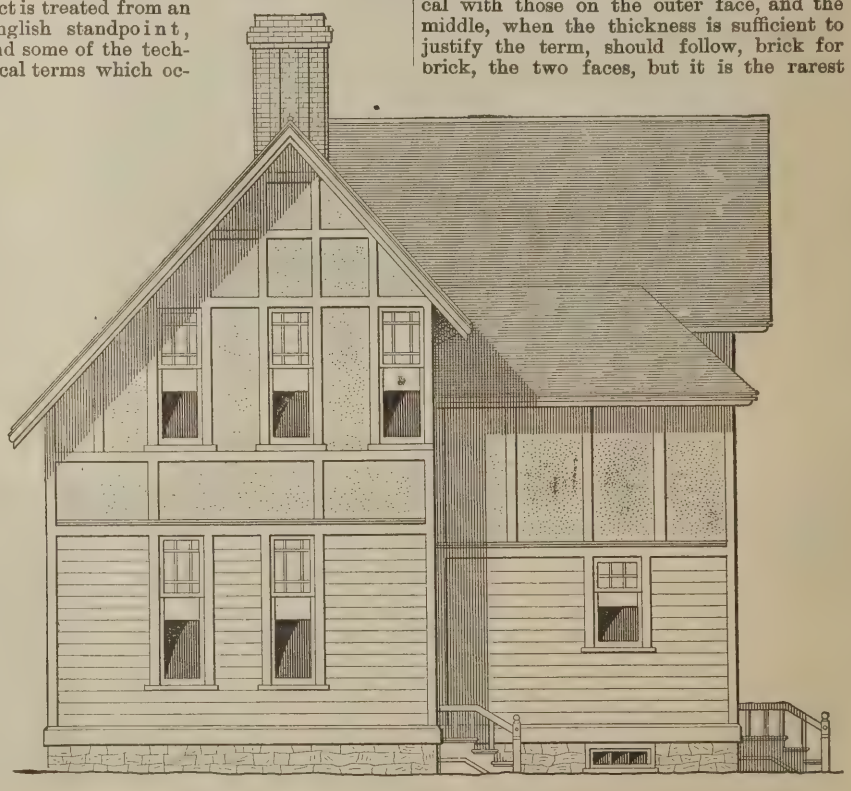
The literature of bricklaying is comparatively meager. Very little has been written or printed upon this subject, and, accordingly, whatever appears from the pen of those who are really competent to treat it must command attention. Mr. J. Woodley recently read before the British Association of Clerks of Works a paper on this subject which contains many facts that will be of interest to our readers. The subject is treated from an English standpoint, and some of the technical terms which occur in his utterances are comparatively unknown in America. Their meaning, however, is sufficiently indicated by the context in most cases to enable the reader to gain the meaning. We append a very careful abstract of the paper:

Now, the most incompetent bricklayer is fully alive to the necessity of bonding on the face of a wall, it being considered an unpardonable fault if he is caught, even in the most rough description of work, with the bricks so placed that a vertical joint in one course is brought directly over a similar joint in the course immediately beneath it, technically known as a "straight joint." It is also a poor workman who is not aware of the importance of preserving, or at least some attempt to preserve, in fairly good face work a plumb line with the perpends—that is to say, that every brick, as placed in the first course, should keep the same position in every course alternately in a direct vertical line to the top of the wall. Again, a fairly skillful and intelligent bricklayer knows (and he is not skillful if he does not know) that in setting out the position of the bricks in the first course of a wall, if it is to be face work, the several features in the elevation upward should be taken into account, so as to obviate any change in the perpends as the works proceeds; and all, skillful and unskillful, can distinguish the difference between what is known as "Flemish bond" and so-called "old English bond;" but, beyond these matters, few ever trouble themselves in regard to bonding.



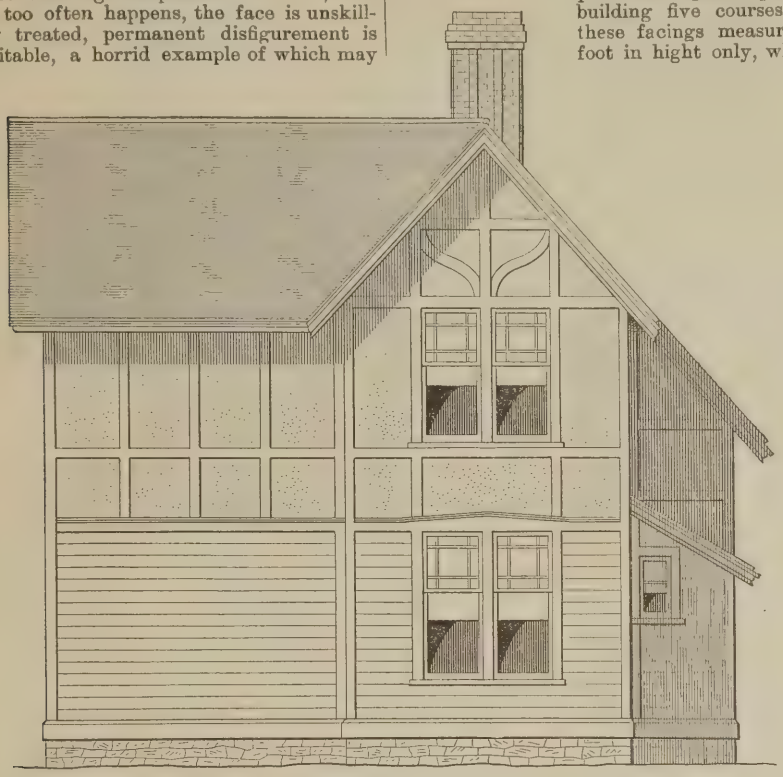
Second Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.

To produce perfect bond it is necessary that every brick or half brick should occupy on the inner face of a wall a position identical with those on the outer face, and the middle, when the thickness is sufficient to justify the term, should follow, brick for brick, the two faces, but it is the rarest thing imaginable to find it so, or, even so, it is more than likely the result of chance rather than from careful foresight or judgment. We often hear a deal of talk about Flemish bond as applied to face brickwork. I do not know how it is that this system is so frequently adopted by architects; of this I



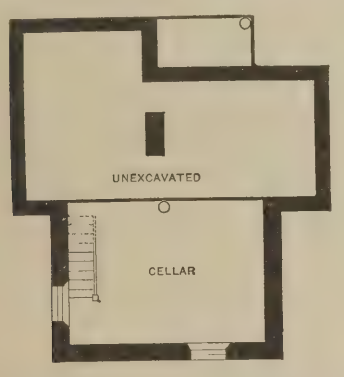
Left Side Elevation.—Scale, ⅛ Inch to the Foot.

am certain—that, did they know but a tithe of what I could tell them of the disreputable practices to which it gives rise in respect to the inner section of a wall, it would not be so frequently provided for in their specifications. Even at its best it is a defective arrangement, for, beyond the face half brick, perfect bonding is impossible. And if, as it only too often happens, the face is unskillfully treated, permanent disfigurement is inevitable, a horrid example of which may be seen in the case of a new building of no mean pretensions now nearly completed in the neighborhood of Bloomsbury.

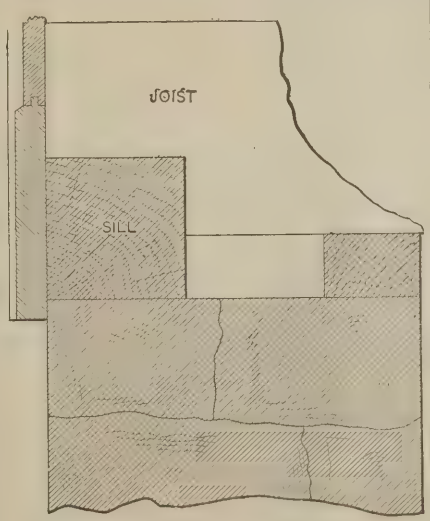


Inexpensive Frame House.—Right Side Elevation.—Scale, ⅛ Inch to the Foot.

There is a system, or rather no system, in bonding of which I have heard, and had it described to me as being in common practice in the manufacturing districts, and in, I believe, some parts of America, where, to dispense with outside scaffolding, the bricklayers stand, or partly so, on the wall, and lay the face courses overhand. For convenience of standing and reaching over, and also to facilitate rapid progress, a certain number of stretching courses are laid on the face successively, say three, four or five, as may be, and, when the remainder of the thickness of the wall is leveled up to the top of these, a "thruff," as it is called, which means a bonding course of headers, is run through, and then the stretchers are laid as before. A specimen of this kind of bonding may be seen in the case of the large pile of buildings situated at the rear of the new law courts, the whole of the walls of which are systematically made up with three consecutive courses of stretchers to one course of headers; so that in every foot in hight there is but one bonding course, instead of two. I need scarcely say this method, whatever reason may be assigned for its adoption, is diametrically opposed to the fundamental principles of brickwork. Similar results follow where, as it sometimes occurs, the facings are purposely made of a different thickness to the bricks provided for the body of the walls. There are many examples of such work to be seen; in one prominent special public building five courses of these facings measure a foot in hight only, while the bricks for the facings are of the ordinary kind, and rise a foot in four courses. Thus it will be seen that in the absence of some fluke no lateral tie or bonding can occur other than one to each foot, or one in three of the leading courses. Now, suppose in such work heavy projections are thrown out, the leverage would naturally act upon the facing bricks as a fulcrum, and have a tendency to tear them away from the mass. To any one accustomed to look through a brick wall it is impossible to look upon such work as this without a certain amount of humiliation, because he must know that in those courses of heading bricks, which to less practiced eyes appear to fulfill their legitimate purpose, two out of every three cannot be otherwise than a mere sham. Nor is that all, for he will not fail to see that in the case of the actual bonding course, the width of the face-headers being 5 inches as against 4½ inches—the width of those in the interior—the former will overrun the latter, thereby destroying the regular methodical quarter brick lap peculiar to perfect bonding. Again, the length of the bonding headers—10 inches as against 9 inches—necessitates wider walls to provide room for this extra length. The additional width not being required for the intervening courses involves an open expenditure of mortar to fill up the superfluous space.



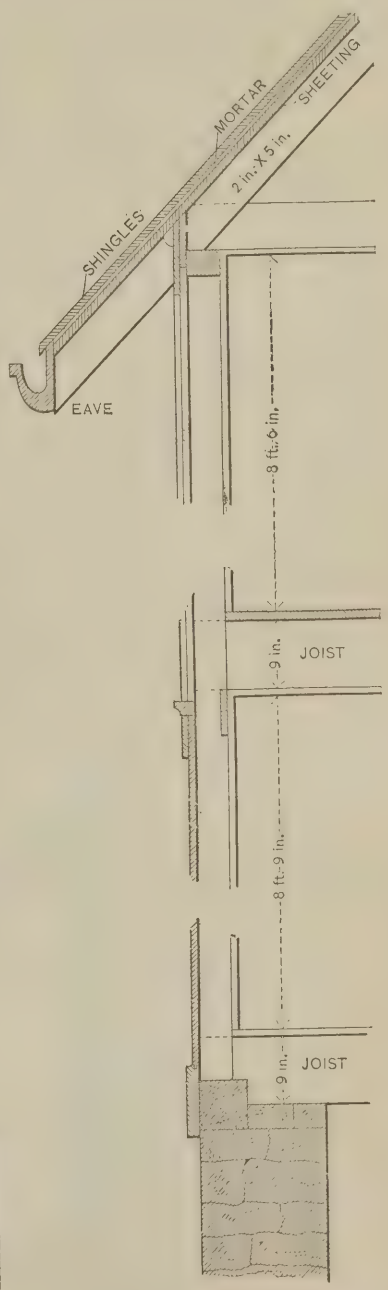
Foundation and Cellar Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.



Section Through Sill.—Scale, 1½ Inches to the Foot.

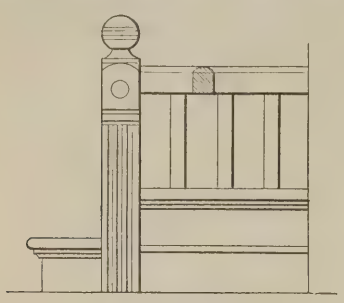
Repairs to Wood-Working Machinery.

All wood-working machinery, during those intervals of comparative leisure which occur in all establishments, should be subjected to a thorough and complete inspection, cleaning and repairing for the coming year's work. It is not to be understood by this that a mere casual glance at and wiping off of the several machines is what is required. Every machine, from the largest to the smallest, should be carefully examined in all its details, and all hands, instead of being laid off, should be employed in stripping down and taking every machine apart, each man to the one he operates. After taking it apart, thoroughly clean each part. This, says a writer in *Woods and Forests*, is an important step, because without it no machine can be properly put together, neither can defects which may be the result of accident or wear



Vertical Section.—Scale, ½ Inch to the Foot.

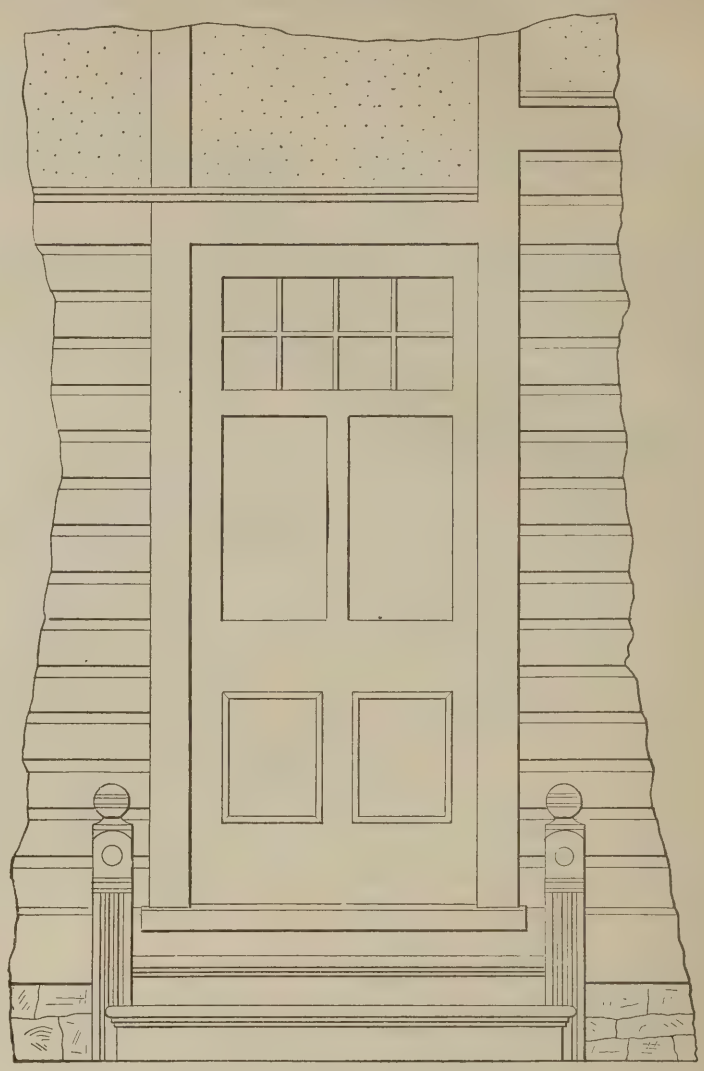
be so readily discovered. A small quantity of benzine and cotton-waste will facilitate the work of removing gum or resinous substances from the surfaces. Boxes should be cleaned and the oil holes cleared of all obstructions; oil grooves and canals scraped out, and the finished surfaces cleaned of rust and dirt. Rolls should be treated in the same manner; matcher spindles removed, and the self-oiling chambers emptied of all the residuum therein. Self-oiling boxes should be taken apart, emptied of all the accumulation of the past year, and carefully rinsed with benzine, care being taken to wipe off all gritty substances that may adhere to them. Cylinders and cutter-heads should be removed from their bearings and carefully cleaned. All live or moving screws



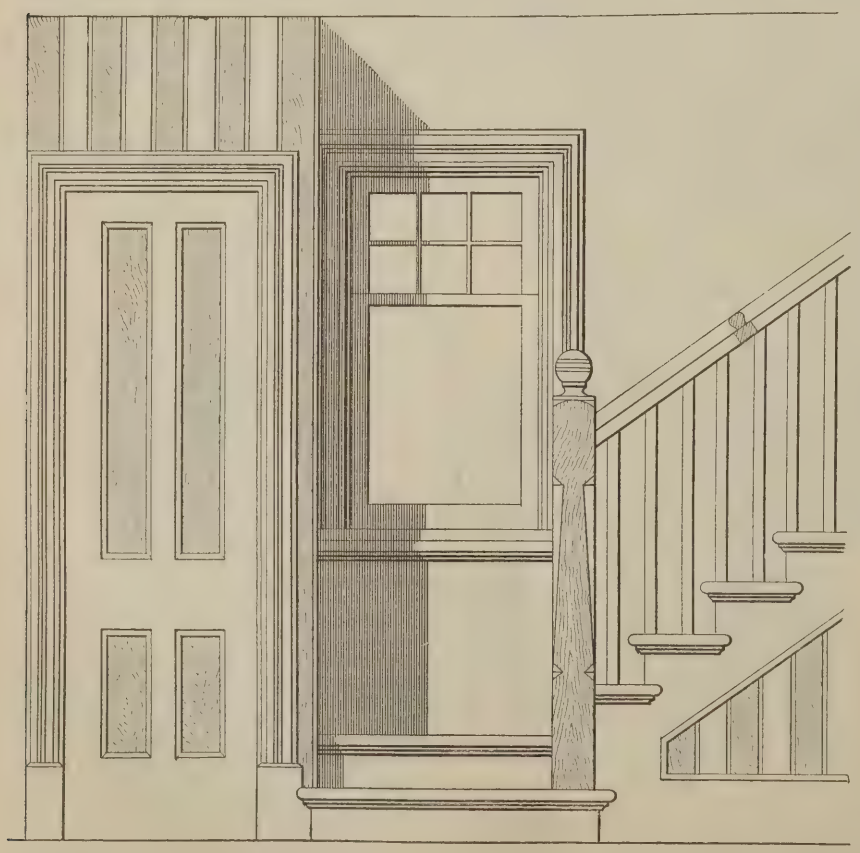
Inexpensive Frame House.—Side Elevation of Steps.—Scale, ½ Inch to the Foot.

or nuts should be well cleaned out and oiled; sliding surfaces and movements should receive the same treatment; gears and pulleys should be cleaned out and the machine frames brushed off, so that one could find out what the original color of the paint was. Levers and fulcrums should be taken out and weights removed therefrom, leaving nothing of the machine together but the bare frame or skeleton.

After this has been carefully done, each operator should begin an investigation of the several parts and pieces with reference to their future use and repairs, and set aside the parts supposed to require repairs, then consult with the foreman or superintendent as to the expediency of those repairs. If none are required, the machines can at once be put together and set in order for immediate use. If, however, repairs are needed, have them done at once. Do not let them wait a week or a month, but have them done while the mill is idle, even if it costs more than will save money, trouble and delay at some future time when you are pressed with work at some other time; for, depend on it, you

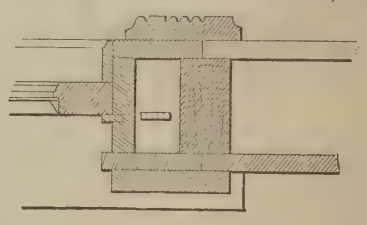


Door and Steps.—Scale, ½ Inch to the Foot.



Side of Hall, Showing Stairs, Coat-Room and Stair Window.—Scale, ½ Inch to the Foot.

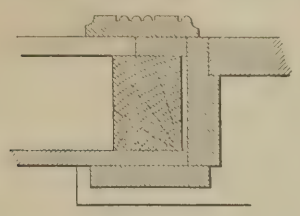
and do not want to monkey around a machine shop when you should be getting out orders that will be away behind time. If the proper equipment of ordinary tools is at hand a good deal of the repairing can be done in the mill at little expense. Boxes and bearings that have been lined with babbitt and are badly worn can be relined; rough spots on shafting that has become cut or abraded can be put in very fair order by draw-filing the same and finishing with a smooth file. Driving gears that have become worn away out of shape on the surface of the teeth should be brought up to their original form with a coarse file; nuts



Window Jamb.—Scale, 1½ Inches to the Foot.

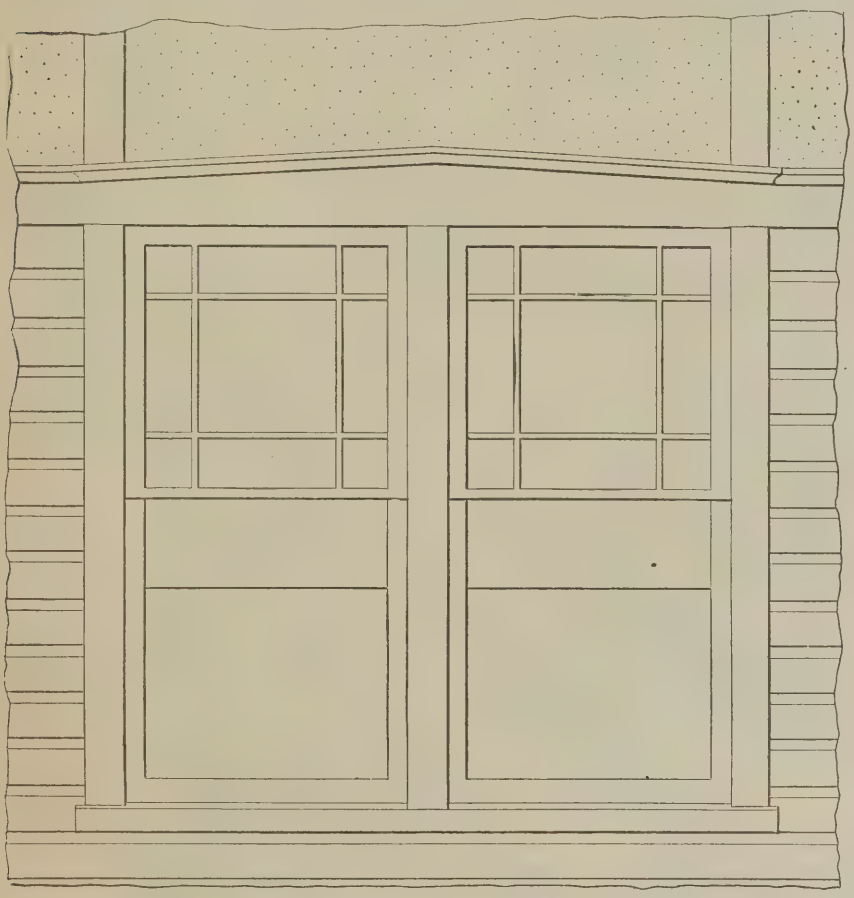
and screws should have their threads examined and all burrs filed away. All the bolts and nuts of cutter heads of all kinds can be taken out, and if any are found broken, bent, or stretched so badly in the threads as to be useless, they should be replaced at once. False bed-plates and matching guides must be tested with straight-edge, and if found out of truth they should be replaned and the bed-plate packed beneath as much as the thickness has been reduced by planing. This provision will obviate any necessity of changing the hight or alignment of rolls, &c. All pressure-bars, press-plates and other parts that have to do with either the alignment of the machines or the holding down of timber should receive the same

treatment as the bed-plates. Matcher or cutter heads should be tried for balance and truth of bearing, and, if found necessary, be returned and balanced, and the bearings



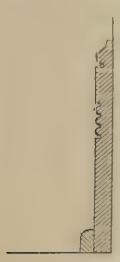
Inexpensive Frame Dwelling.—Door Jamb.—Scale, 1½ Inches to the Foot.

or boxes for same be relined with the best of babbitt metal. Loose pulleys should be attended to by having all those that are found defective or worn large on their shafts



Exterior Details of Windows.—Scale, ½ Inch to the Foot.

bushed or refitted. Boxes and bearings that are not worn enough to warrant relining should have new liners that will hold the spindle down firmly and at the same time admit of being revolved easily. While all this is going on in the mill, the engineer should be doing the same kind of missionary work in the engine-room, and others should be set to look after the proper alignment of all the line shafting and countershafts; and the bearings should be cleaned out and put in proper condition for the economical transmission of power. This is also a very good time to splice and join belts, and to file saws and even knives and cutters that are in general use and do not need immediate regrinding. In a word, everything that can be thought of pertaining to the proper condition of each and every machine about the place should, if possible, be done at this time.



Base.—Scale, 1½ Inches to the Foot.

The Manufacture of Roofing Slate.

It may be of interest to those of our readers, says the *Slate Trade Journal*, who are not familiar with slate quarrying and the manufacture of slate, to follow briefly the various processes undergone by the slate rock from its position in the bed until it is placed in rows on the banks of the quarry, ready for shipment and for the roof. The first operation is the quarrying of the large blocks from the beds in the quarry. The first step consists of separating such portions of the bed from the main body as may conveniently be hoisted out of the pit to the bank. This is generally done by blasting. The hole is drilled by means of an ordinary drill, which may be used by one man lifting it up and down, or by two men, one holding and turning it in the hole and the other striking it with a hammer. In some quarries, where the beds are favorably located, the steam drill or compressed-air drill is used to very great advantage. The size, shape and position of the hole will depend largely upon the object to be gained, much fine discrimination being used on this point, it being of considerable importance. The explosive generally used is the common rock-blasting powder, the force wanted being sufficient only to heave the rock with as little breakage and shattering as possible. The depth of the hole and quantity of explosive to be used will depend upon the occurrence of such natural helps as joints, floors and slips, of which the skillful quarryman knows how to take the best advantage. The large blocks, having been obtained in as good condition as possible, are hoisted to the top of the quarry by means of derricks; they are then separated into smaller pieces or blocks of convenient sizes for the slate-maker. In this operation the skill and judgment of the quarryman are tested, the object being to shape these blocks so that as many slates as possible may be made out of them with the least amount of waste. These blocks are generally about 2 inches thick, and of such dimensions as will make a given size of slate. The cutting or splitting of the large blocks into smaller ones is done by making a notch at one side, or in the end, and driving a wedge along the line on which the break is to take place; sometimes the notch is cut on one side, and the break produced by striking the block on the opposite side with a heavy wooden mallet, or a hole may be drilled somewhere on the line of the break and two iron wedges placed in it, and a third one driven between them, forcing the block to split in the direction required. This operation is sometimes called "pillaring," but more generally "block-making," in this country. These reduced blocks are then taken to a hut or shanty, where they are split and dressed into roofing slates. The first operation is performed by a splitter, who is seated on a wooden block raised slightly above the level of the floor. He is provided with a wooden mallet and three or four splitters, which are thin chisels with a broad, fine edge from 10 to 15 inches in length, and the broad end from 2 to 3½ inches wide. He takes a block and places it against his left thigh, with the smoothest and straightest end uppermost; then places his chisel in the center, and makes two or three cuts all in a line; the center one of these he drives further into the block, which begins to split; he inserts a second chisel and works the two backward and forward until the split extends down the block and divides it in two along a cleavage plane. This operation is repeated until the desired thickness of the slate is attained, greater care being required as the slabs become thinner. These irregular slates are now ready to be squared or dressed into the required sizes.

Detail of Belt.—Scale, 1½ Inches to the Foot.

The hand method of dressing, still used to a certain extent in Wales, but entirely out of use in this country, is briefly as follows: The dresser sits with a wooden bench on which is fixed a steel knife or frame before him. In his right hand is a long knife or dresser. He places the thin slate slab on the carrier, and with one blow trims one straight side, and then one straight end, at right angles to each other. He is provided with a gauge, with which he is able to mark the length and width of a given size; the slab is squared according to these marks, and the result is a finished slate. The slates are sorted by the dresser according to their several sizes and according to their grade or quality, and stacked in piles ready for shipment. There are several kinds of machines in use for dressing slate which greatly facilitate the operation and enable the dresser to make a more uniformly square slate.

Preparation of Building Blocks from Furnace Slags.

A method is in use at the Königin Marienhütte, at Cainsdorf, in Saxony, for making the building blocks from furnace slags. The method is based on the fact that, if a large lump of solidified slag is broken by hammering, the pieces from the interior are always considerably tougher and stronger than the outside. A pit is made, lined with suitable brick or stone work. The bottom consists of a cast-iron plate, 2 inches thick. On this plate stand iron blocks or carriers, 2 inches high, which support another iron plate having holes 2 inches in diameter left in it. On this perforated plate stand the molds for the slag blocks, so arranged that each mold stands over one of the perforations in the plate, the molds themselves being open at the bottom and top, like molds used in making bricks by hand. After the molds are placed on the plate they are covered over by another plate or plates, with similar perforations, one to each mold The slag is allowed to flow into the pit and down on to the bottom plate, rising up and filling the space between this and the plate under the molds, and passing into the latter through the perforations. The liberated gases escape through the perforations in the plate covering the molds till the slag rises high enough in the pit to cover this plate and flow into

the molds also from the top. The slag is allowed to rise at least 2 inches above the top plate, and then the mass is left to cool slowly for 36 or 48 hours, according to the size of the pit, after which the slag blocks are broken out. The blocks so prepared are said to be very good, and are used for pavements, for building, &c. Even very basic slags and blast-furnace slags are stated to make very serviceable blocks under this treatment. Instead of a special casting pit for the blocks, the slag wagon may be used by putting the iron blocks or carriers on the bottom of the wagon and placing the mold then between two iron plates, as above described.

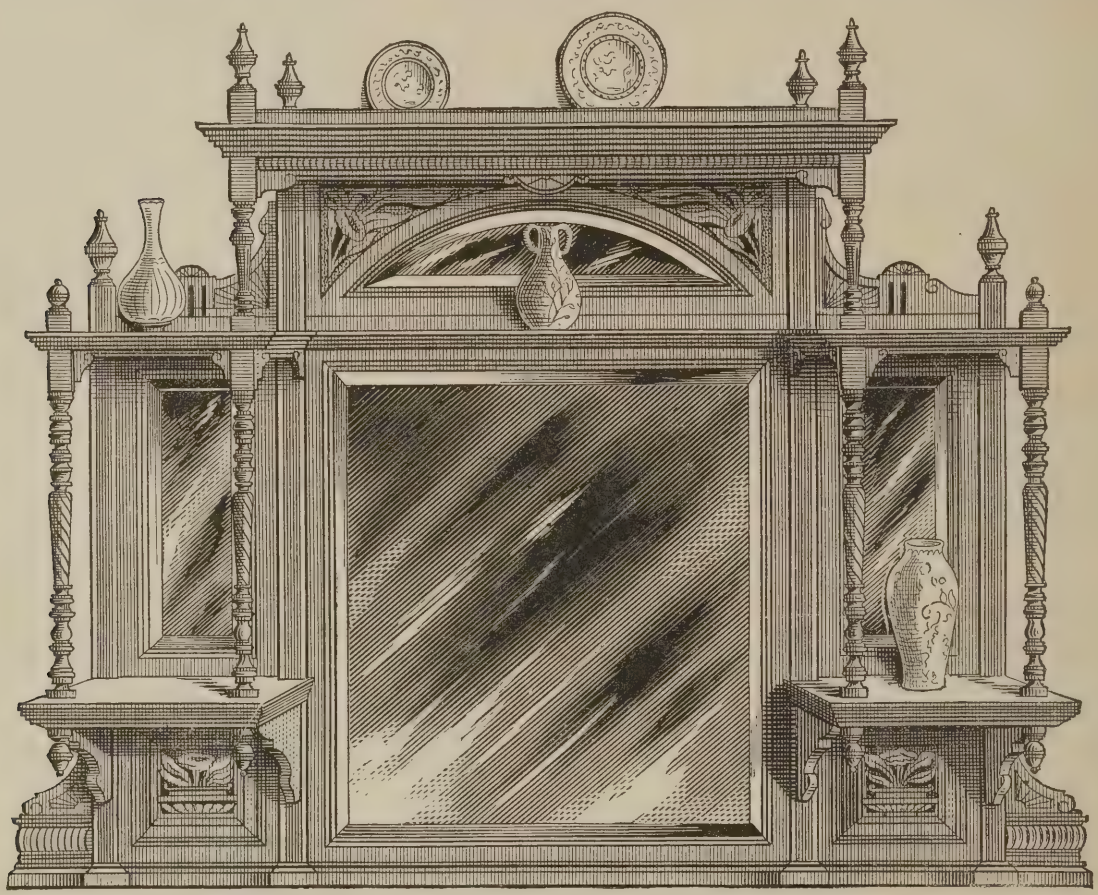
NEW PUBLICATIONS.

MAN'S BIRTHRIGHT; OR, THE HIGHER LAW OF PROPERTY. By Edward H. G. Clark; 133 pages, 5 x 6 inches, bound in cloth, with gilt side title. Published by G. P. Putnam's Sons. Price, 75 cents.

This little book is a popular contribution to the study of political economy, which is engaging the attention of many thinkers at the present time. We gain from the introduction that the suggestion of this volume grew out of the careful editing of David Reeves Smith's volume entitled "Ownership and Sovereignty." This work, the author intimates, may possibly be read when his volume will have shrunk into a commentary, but for the general reader of the present day he thought it necessary to take the one great inclusive principle of that work and to redress and rearrange and elaborate it from beginning to end. The result is the volume before us. The publishers, it may be stated, do not fully indorse the conclusions of this author. Mr. Clark claims to have arrived at a radical and well-founded solution of the fixed questions concerning the rightful ownership of the earth's surface and of property depending upon nature's bounty. These conclusions appear to the publishers ably and forcibly presented, and to be entitled to respectful consideration. It is their belief that the essay will be of service in inducing discussion in the right direction. They think it will also prove of special service in offsetting what they characterize as the barren and pernicious theories of Henry George in his volume entitled "Progress and Poverty." The work is embraced in four parts, with an introduction and conclusion. It is readable throughout, and will no doubt command attention by those who are interested in the general subject discussed.

A NEW SYSTEM OF HAND-RAILING. Containing a Large Number of Illustrations, with Full Instructions for Working Them. By an Old Stair Builder. Revised and corrected edition, 65 pages of text, with folding plates and numerous illustrations, 5 x 7 inches, bound in cloth. Published by the Industrial Publication Company. Price, $1.

This little work is divided into two general parts, the first relating to geometry and the second to the methods of getting out work. The treatise on geometry is taken from "Practical Carpentry." The method of getting out wreaths for hand-railing which is explained in this work is declared to be not general in this country, although not new. The advantages are summarized in the preface. It is stated that time and material are saved and the wreaths formed with more accuracy than cutting them out by other methods. Any wreath whatever, it is stated, may be cut out from a plank of the same thickness as the diameter of a circle described around a section of the rail. Several complete examples are given, with illustrations and descriptive text. The authorship of the book is not revealed, but it has been carefully edited by Mr. Frederick T. Hodgson.



DESIGN FOR OVER-MANTEL, FROM CATALOGUE OF A. GOSLETT & CO., LONDON, ENGLAND.

SPON'S MECHANIC'S OWN BOOK. A Manual for Handicraftsmen and Amateurs; 702 pages, size 6 x 9 inches, 1420 illustrations, bound in cloth. Published by E. & F. N. Spon. Price, $2.50.

This work may be characterized as an *omnium gatherum*. It is almost encyclopædic in the range which it covers, and yet in some respects it lacks the thoroughness with which modern work of that kind is commonly done. Very little attention has been paid to typographical embellishments, such as printers are often in the habit of giving their work. Chapter headings are almost ignored, and everything has been sacrificed to the object of getting the largest possible amount of matter in the smallest amount of space. The paper on which it is printed, however, is good and the type is fairly clear. The sub-title shows the real scope of the work. It has been prepared more for amateurs than for skilled mechanics. It covers too much ground to be thorough in the sense of affording assistance to those who are fairly well skilled in their respective trades, and yet it presents in an attractive manner just those things which mechanics in other trades would be gad to know concerning allied industries. If each of the 30 chapters contained in this work were expanded into a volume, as they all might be, some very desirable additions to mechanical literature would be the result. A number of special American tools are shown, notably among carpenters' and machinists' tools. The illustrations for the most part are done in outline, and are very clearly drawn. The book will bear examination by mechanics generally, and will well repay reading. The general information that the mechanic desires to acquire concerning trades allied to his own can scarcely be better presented than in this work, but those who take it up expecting to gain from it practical ideas concerning their own trade beyond the point reached by ordinary workmen will be apt to be disappointed.

The stations on the elevated railroad which have recently been opened in Brooklyn make use of sheet metal to a certain extent, in this respect following in a measure the example of some of the stations on the New York elevated roads. The sides of the Brooklyn buildings, however, are of slate. The slate is extended across the front even in those cases where it comes under the platform roofs. A wooden wainscoting extends up the usual hight, and from this line to the top or cornice the wall is covered with slate. This kind of wall finish is scarcely to be recommended, so far as suitability and general appearance is concerned, particularly in those places where walls are measurably protected by the platform roofs, as above mentioned, and where they are exposed to defacement. The slate in this case serves a very useful purpose in affording a place for amateur artists to sketch alleged cartoons and comical portraits, and also for silly people to write their names.

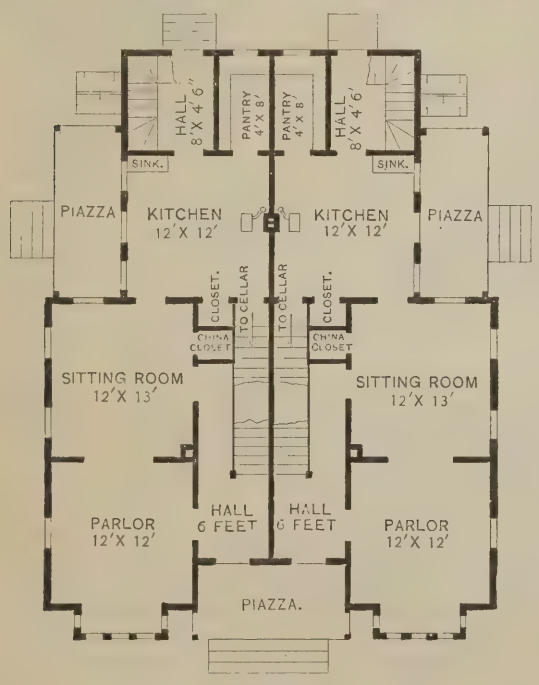
The road had not been open many days before the usefulness of the walls in this respect was discovered and utilized.

Double Frame House.

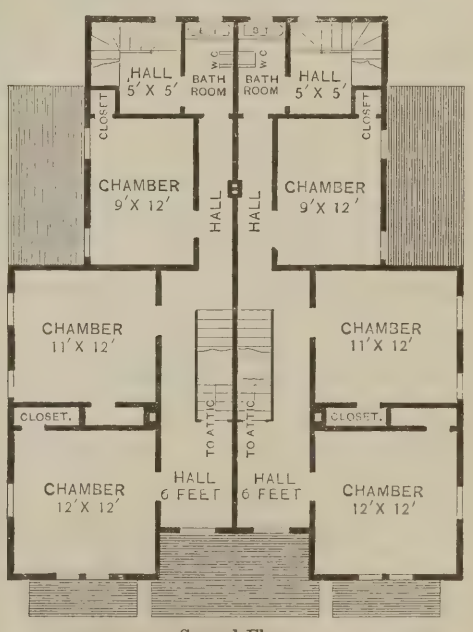
The photograph from which the accompanying engraving, representing a double frame house, was made was furnished us by

Double Dwelling at Chicopee Falls, Mass.

Messrs. D. B. Griggs & Sons, Chicopee Falls, Mass. It represents a style of tenement house which this firm have been building for some two years past, and of which we understand no less than 11 buildings have already been constructed. Slight modifications are made to suit individual requirements, but the design shown indicates the general style of the work. We also present



First Floor.



Second Floor.

Floor Plans.—Scale, $\frac{1}{16}$ Inch to the Foot.

The engraving of the exterior of the house was made by a direct process from a photograph, and shows the building exactly as it appears. The floor plans speak for themselves.

The roofing materials used in North Germany are tiles—plain and ornamental—slates of English and German fashion, corrugated iron, galvanized iron, zinc, copper, lead, asphalt, roofing paper, felt and wood cement. In the case of tiles, the effect of some of the German roofs is very good. The laths are laid from course to course, and on each lath is hung a double row of tiles, the upper being supported by the lower course. There is always a thickness of two tiles, and in parts even of four tiles. The heavily-weighted laths are from 1½ to 2¾ inches wide, care being taken in the selection of the wood. The church of St. John, Altona, is roofed with plain tiles, and some of the German churches have colors laid in patterns. German tiles are 4 or 5 inches longer than English tiles. Slates have only been introduced as a roofing material in many of the North German towns during the last 50 years. In several cases Welsh slates are now used, the German mode of laying slates being in oblique courses. Copper appeared to be chiefly used for public and municipal buildings of the first class, especially spires and domes. Zinc is now perhaps the material most extensively used for covering buildings where it is a matter of no great moment that there should be an equable temperature beneath. Forty years ago it was unknown in Berlin for roofing purposes, but it is now used there to a very great extent. Galvanized corrugated iron is extensively used for the roof coverings of the new prison buildings in Hamburg. Instances of the use of lead for roofing in Germany are very rare, it having been superseded by zinc and copper. Roofing paper is largely used for buildings where great economy is desired. It is necessary, however, to retar it every two or three years. Wood cement is one of the most important roofing materials in North Germany.

Drying Wood.

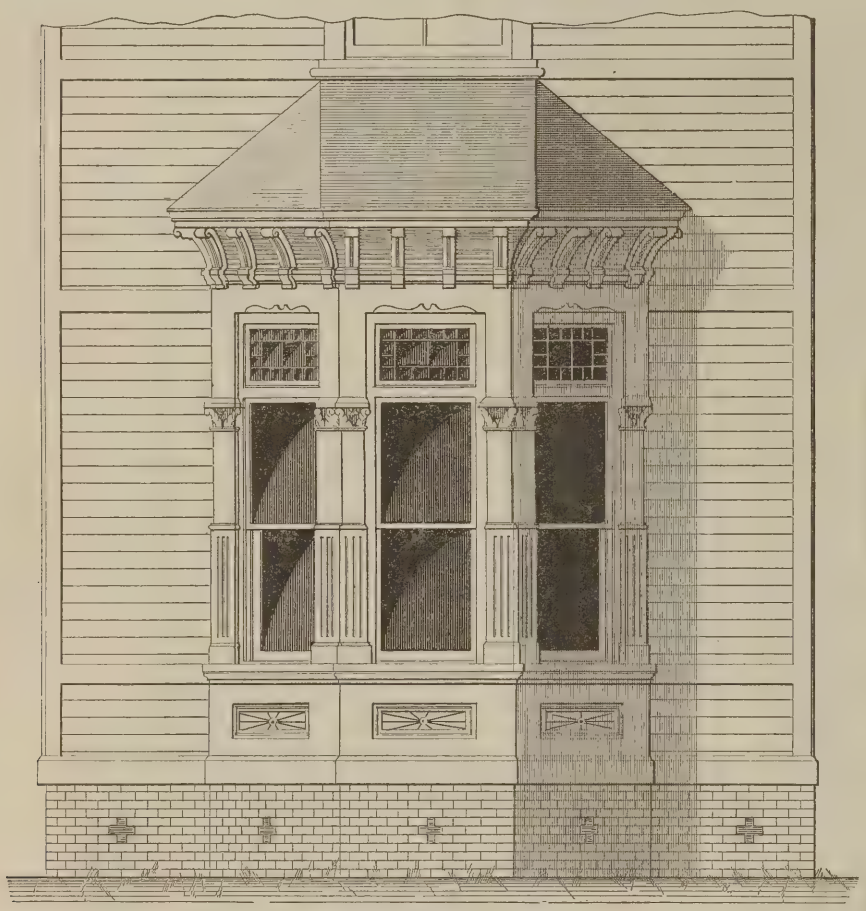
On the subject of drying wood Mr. J. Justen has written as follows: "Wood is a porous body, and contains in its natural state, whether dead or alive, a certain amount of moisture. By the loss of that moisture, or with the increase of the same, the bulk of the wood either contracts or extends. If we have a piece of wood where the action takes place only upon one side, it is obvious that the piece will alter its form or shape. The consequence of the loss of moisture is also the warping and the splitting of the wood. The inner structure of a stem is irregular; for instance, we find the inner moisture of a yearly ring to be more than on its outer side. This causes the splits on the exterior after the wood is dry, and it also accounts for the impossibility to form out of the green wood a regular body which could not lose its weight or shape. The time during which the evaporation of the moisture takes place depends upon the state of the atmosphere. Several authors are of the opinion that the contraction is regulated by the specific weight. This, as a rule, cannot be adopted; for instance, lilac and oak, both being heavy and hard, contract quickly,

engravings of the floor plans. Concerning the finish of these buildings our correspondents inform us that the hallways and dining-room or sitting-room are done in oak and the kitchen and bathroom in hard pine. The cost of a building of this kind in the vicinity of Chicopee Falls is stated to be about $3200. The building here shown was erected for the Dwight Mfg. Co., a large cotton manufacturing concern, for the occupancy of their overseers. Messrs. Griggs & Sons are both architects and builders, and in the conduct of their business are endeavoring to meet the reasonable demands of their customers both in style of work and convenience of arrangement, and also in cost.

while the South American maple, which is equally hard, contracts slowly. It is evident, however, that the fuller of sap a tree is, the greater will be the contraction. This will account for the fact that we find on cut timber the cracks extend from the exterior toward the center, because the sapwood will contract more than the heart of the wood. Planks turn with their sides upward—that is, the edges rise from the level of the center line. This explains why we turn the inside of a plank toward the joists while we lay a floor, which prevents the twisting. The contraction and action of the wood cannot be checked altogether. Among the means to prevent it stands foremost the one of putting the tree into water; but when taken out it must not be stored in a place where it dries too soon, as it still would burst if done; nor must it be left too long in the water, as this will injure the quality of the wood."

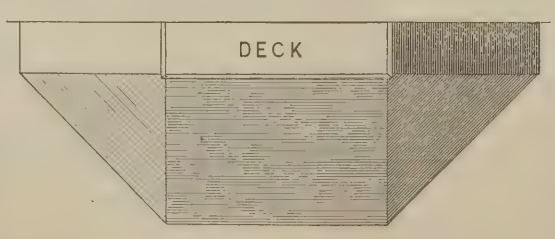
Design for Bay Window.

The accompanying elevation, roof plan and details of a bay window, contributed by Mr. W. C. Hoffmeister, of Knoxville, Tenn.,



Bay Window, Contributed by W. C. Hoffmeister, Knoxville, Tenn.—Elevation.—Scale, ¼ Inch to the Foot.

are of a design neat in general appearance and substantial in construction. The design is one that harmonizes in many respects with the fashions in architecture that are current at present. Our readers have frequently asked for drawings of bay windows for use in altering old buildings. The present design is as well adapted for such uses as almost anything that could be presented. While it has not been prepared especially for this purpose, it contains those elements which are readily modified to suit requirements, and, accordingly, it is likely to find wide application. Mr. Hoffmeister has represented the construction as well as the design in a very clear and unmistakable manner, and there are few questions that would arise in the construction of this work which he has not anticipated.

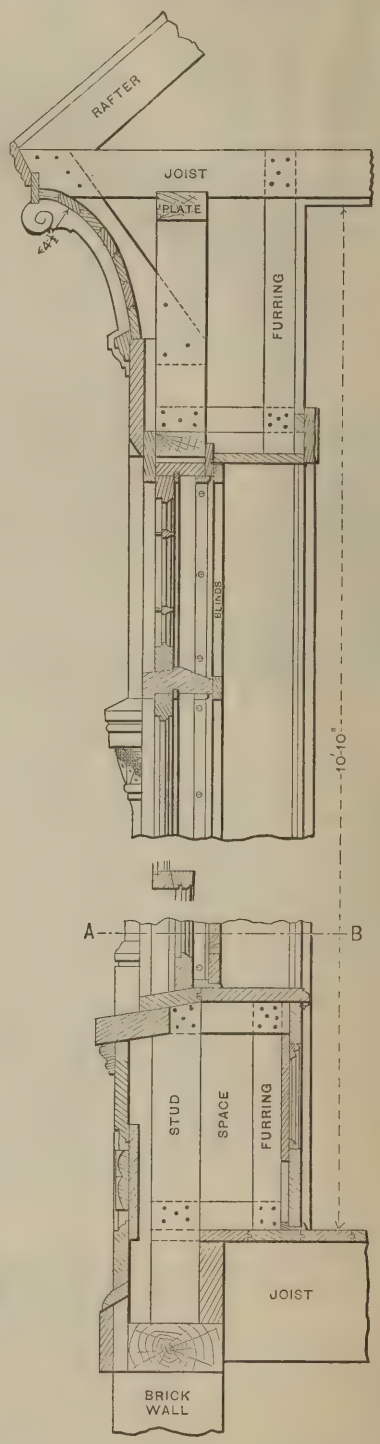


Roof Plan.—Scale, ¼ Inch to the Foot.

The Hall and the Reception-Room.

"In my book, 'The House Beautiful,'" says Clarence Cook, "I have described a vestibule, or a hall, rather, in what is called here an English-basement house, and I have given the plan of the first floor of the house itself. But this arrangement, though an excellent one in itself, had the disadvantage of making us go too high to our bedrooms, and it is impossible that such a plan should ever become popular until steam shall be as common as oleomargarine and laid on to every house, like gas, water, electricity and taxes, so that an elevator can be had by any one who wishes it. In the meantime people are busy trying to get the better of the uninteresting and uncomfortable hallway which the monotonous minds of New York builders have imposed upon the generation. Nothing could be devised that would not be better than the long passageway running from front to rear of 99 out of every 100 houses in this city. No privacy is possible; but the long ladder-like stairs must be mounted and descended in plain view of the whole population of messenger boys and the errand boy in general, while nothing like decoration or even the appearance of comfort can be given to such barrack-like arrangements. What has been attempted in some cases lately is to divide this long passageway, and there are several methods of doing this. One way that has much to recommend it is to shut off the stairs from the immediate view of the front door by a low screen of wood, with perhaps a seat against it on the outside. This device, among other gains, gives a seat where the room can be best spared. The wall space on the stair side can then be fitted with a table of some kind, with a glass and hat-rack, and a small but convenient vestibule is thus obtained, and, besides the comfort of it, the appearance of the entrance is much bettered.

"I know a house where an arrangement such as I have been describing has been



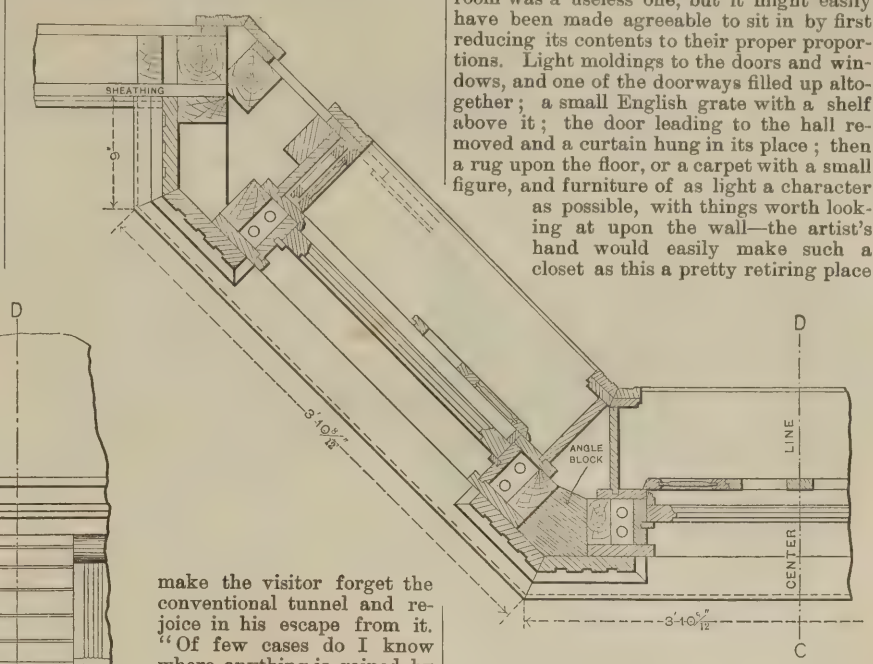
Section on Line D C of Views on Opposite Page.—Scale, ¾ Inch to the Foot.

carried out very prettily. The newel post is carried up to a good hight and a rod carried across from the top of it to the wall. From this rod hangs a curtain of light woolen stuff, not embroidered, but with a woven pattern in gold colored silk. This curtain comes down to the top of the low screen, solid below and filled in with slender balusters in the upper part. Against this screen is placed a hall bench of the seventeenth century, which was bought in Amsterdam for $5, and would have been cheap at $30. Against the wall in front of this bench, or rather at the side of it, was placed one of those oaken chests of Colonial times that once could be picked up about Boston, and

this made a handsome table. Above it hung a mirror and some framed prints, with two or three *bas-reliefs* in plaster, toned down in wax and gold paint to an old-ivory richness and harmony with their surroundings.

"By carrying up a wainscot with a flat rail at the top on the side opposite the table the wall above can be made available for prints, etchings, photographs hung on a level with the eye and flat to the wall. The wainscot makes these objects seem to be a part of the wall decoration, while without the wainscot they have a commonplace look and are apt to be disturbed. A pretty effect is produced in some of these passageways by a light arch, thrown across from about that point in the stairs where the hand-rail of the kitchen stairs strikes it from below. The post that supports the arch on the side of the stairs has the effect in the design of dividing the long line of the baluster, and the top of the arch—the whole affair must be designed with solid lightness—supports some bust or figure, the Mercury of John of Boulogne, for example. This archway does not in any way interfere with the free use of the passage—too narrow, as a rule, at this point to bear any diminution. Its only use is to break up the empty length of the passage, and it accomplishes this in a way to make the visitor forget the conventional tunnel and rejoice in his escape from it. "Of few cases do I know where anything is gained by having what is called a "reception-room" shut off from the hall, unless such a room can be made large enough to serve as a small parlor. And this can only be when the house is of full width—a thing not often seen nowadays. Generally these rooms are mere apologies for closets, and it would be much wiser to throw their space, small as it is, frankly into the hall or passage. But if we think we must have the little half-breed room, then let us make it look as large as we can by putting into it only what suits its size. I have elsewhere inveighed against the New York builders' habit of putting doors, windows, fireplaces and moldings of the same size into all the rooms of any one floor, irrespective of the different conditions. I have in my mind's eye a "reception-room" of the charming proportions—not unusual in this "builder"-ridden city—of, say, 5 x 13. At one end a door and at the other a window fills up all the space there is. Another unnecessarily large door on the side next the passage, and on the other long side a chimney pier with a fireplace. Now, in this "cubby-hole" everything is out of all proportion big. The doors are all double doors, never needed, and when thrown open the valves eat up great pieces of the wall. The chimney breast is of the same size as that in the parlor above, and the heavy white marble mantelpiece, with its grate and all its belongings, is precisely like that in the large dining-room in the rear, that runs across the whole width of the house. The cornice moldings and the moldings of the doors and windows are also the same as those in the dining-room, and, as if the builder had not sinned enough, the owner of the house had turned into the room to pasture a flock of bantling behemoth sofas and chairs—one sofa, with the tact of his kind, at once stretching himself across the door at the end of the room—and the window being already twice too large for the room, vast curtains of heavy stuff rich in fringes had been hung up to keep out the light. The room was a useless one, but it might easily have been made agreeable to sit in by first reducing its contents to their proper proportions. Light moldings to the doors and windows, and one of the doorways filled up altogether; a small English grate with a shelf above it; the door leading to the hall removed and a curtain hung in its place; then a rug upon the floor, or a carpet with a small figure, and furniture of as light a character as possible, with things worth looking at upon the wall—the artist's hand would easily make such a closet as this a pretty retiring place for conference, or a spot to put a ray of sunshine, or quicken germs of beauty in the mind of the district messenger boy or the milliner's bandbox-bearing apprentice.

Bay Window.—Details.—Scale, ¾ Inch to the Foot.



One-Half Cross-Section on Line A B on Opposite Page.—Scale, ¾ Inch to the Foot.

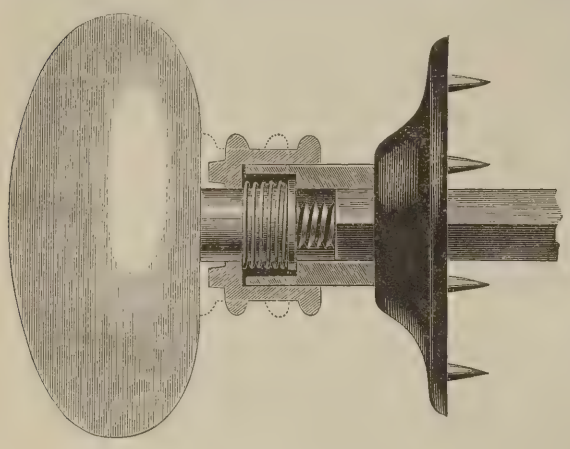
A New Process for Hardening Plaster.

A new process for rendering plaster very hard and capable of being substituted for wood in flooring has been brought out by M. Juhle. Plaster has this advantage over cements, and even over wood, that it increases rather than diminishes in bulk on being applied to structures, but it fails in hardness and surface resistance. To overcome this difficulty M. Juhle mixes six parts of good plaster with one part of rich lime recently slaked and finely sifted. This mixture is to be used like ordinary plaster, and the object made from it when it is very dry is caused to imbibe a solution of a sulphate which has a base precipitable by lime, and this precipitate insoluble. Such are the sulphates of zinc or iron. The theory of the process is as follows: The lime contained in the pores of the plaster decomposes the sulphate, with production of two insoluble bodies, to wit, sulphate of lime and oxide, which fill the pores of the object submitted to the treatment in question. With sulphate of zinc the object keeps of a white color, but with sulphate of iron the object, at first greenish, takes on drying and with lapse of time the color of the sesquioxide of iron. With sulphate of iron the hardest surfaces are obtained, the resistance of rupture being 20 times greater than with ordinary plaster. To obtain the maximum hardness and tenacity it is necessary that the object should first be very dry and steeped in a solution which is practically saturated. The first immersion of the object in the solution ought not to last over two hours, as a too-long immersion at first is apt to render the surface friable. On drying the plaster object afresh after the first immersion there is no further fear of its becoming friable. If the proportion of slaked lime is too great the surface is apt to take a very hard marble-like skin, which prevents the hardening of the inner portions of the object. The proportion of 1 of lime to 6 of plaster, as stated above, has given the best results. Plaques made in this way can be browned by rubbing them with linseed oil and litharge, and glazed on the surface with hard copal varnish. A beautiful glassy flooring like polished oak can in this way be prepared.

NOVELTIES.

The "Victor" Door Knob.

There is probably no article in such common use and yet giving so poor satisfaction as the ordinary door knob. As commonly constructed it very readily gets out of order, and it is seldom repaired until its use is no longer possible. Accordingly, many loose knobs are encountered. Many improvements have been suggested for door knobs, but they have been in many cases too expensive for general introduction, or else so complicated as to make them impracticable. The Victor Door Knob Company, of Cleveland, Ohio, claim to have accomplished, in the device shown in Figs. 1 and 2, a construction that overcomes the ordinary objections and gives a knob that is simple and practicable in all its parts. They claim, further, that it successfully meets the demands of the trade for a screwless door knob. The illustrations present sectional views of the knob in position, and show how it is to be turned up on the spindle until properly adjusted to the door. The roses are first placed in position on the door, the points on their backs being driven into the wood. The spindle, which is firmly secured to one of the knobs, is then passed through the hub of the latch, and the dependent neck, shown in the cut, placed thereon. The free knob, with the sleeve or collar attached, is then turned on to the threaded portion of the spindle until the sleeve reaches the neck. The sleeve is then drawn forward on the neck, the lugs within the sleeve entering the slots at the end of the neck, thus allowing the knob to be turned up on the spindle until it is properly adjusted to the thickness of the door. The sleeve is at this point released. The spring shown in the engraving throws it into the position indicated by the dotted lines in the cut, thus connecting the knob and the neck by the spurs on the back of the sleeve sliding into the notches in the knob. The projections or lugs within the sleeve enter slots in the recessed portions of the neck, as represented in the cut, all being operated by the neck or shank engaging with the spindle at its square portion, as shown. This adjustment, as will at once be seen, is very fine and allows the knob to be made to work very tightly or loosely, as may be required, and to fit any thickness of door within reasonable limits. The knob may be instantly adjusted by turning it up against the door and releasing one point at a time, which is equivalent to the eightieth part of an inch, until it works exactly right. By the same means it may also be readjusted at any time if rendered necessary by the shrinking of the doors. Accordingly, it is possible to always have a close, well fitting knob and a free-working latch, a point which, the manufacturers assert, cannot be justly claimed for any other door knob. When the knob is operated on the door the spring is not brought into action. Its only function is to throw the sleeve into position after it has been drawn forward for the purpose of adjusting the knob. There is, therefore, no liability of the springs giving out or in any way impairing the durability or efficiency of the knob. The manufacturers claim for this device that the knob when attached to the door has all the strength and durability of a bolt secured by a locked nut, and cannot by any possibility get out of order or become loose and shaky. The article is neat in appearance, and it requires a close examination upon the part of one who is not acquainted with the arrangement and combination of parts to discover the means by which the knob is fastened in position. These knobs, we are informed, are made in all varieties of mineral, porcelain, jet and real bronze, and in various styles of finish. We understand that the company stand ready to send a sample of this door knob to any architect or builder contemplating its use.



Novelties.—Fig. 1.—Longitudinal Section of the "Victor" Door Knob.

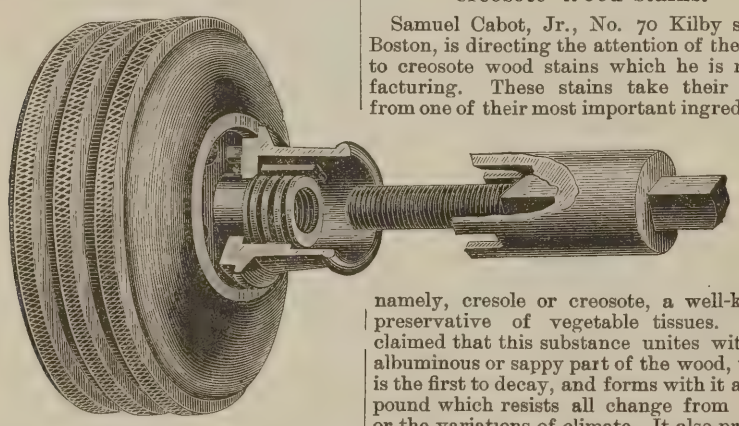


Fig. 2.—Sectional Perspective View of the "Victor" Door Knob.

Creosote Wood Stains.

Samuel Cabot, Jr., No. 70 Kilby street, Boston, is directing the attention of the trade to creosote wood stains which he is manufacturing. These stains take their name from one of their most important ingredients, namely, cresole or creosote, a well-known preservative of vegetable tissues. It is claimed that this substance unites with the albuminous or sappy part of the wood, which is the first to decay, and forms with it a compound which resists all change from water or the variations of climate. It also protects the wood against the ravages of insects, notably the white ant of the South. These stains are manufactured in a great variety of colors suitable for exterior use, and their effect upon the shingled villas and cottages now so much in vogue is picturesque in the extreme. The manufacturer claims for them several important advantages over oil and chemical paints. First is the fact that they are from one-half to one-fifth as expensive as paint. The effect of paint is to form an air-tight screen over all cracks between clapboards and shingles, sealing them tightly, thus confining moisture under them and sometimes hastening the decay of the wood. It is urged, on the other hand, that creosote stains form no screen, and permit the ready evaporation of any moisture which may come between the pieces. The manufacturer also directs attention to the superiority of stains over paint from an artistic standpoint. He also calls attention to the fact that, stains being in the wood and not on its surface, the color is not liable to discolorations by cracks or peeling off. The strains also have the advantage of bringing out with beautiful effect the natural grain of the wood. The cheapness of these stains, the manufacturer states, combined with their great preserving quality, recommends them for priming wood before painting. Painting can be readily applied over the stains after they have been allowed to dry.

Burglar-Proof Door Locks.

The Perkins Specialty Lock Company, Nos. 29 to 33 St. Clair street, Cleveland, Ohio, are directing attention to the advantages possessed by their locks, by which additional security is afforded over other forms of door locks. The leading feature to which attention is directed is that, when locked from the inside and the thumb-knob turned, the lock is left in a condition to be burglar-proof. By turning the thumb-knob the thumb-bolt is thrown, the latch and knob are securely locked and the keyhole closed by a solid piece of steel against the introduction of any key or implement by which the locking-bolt might be tampered with. How this is accomplished will be readily understood by Fig. 3, which shows the lock with the bolts thrown. It will be noticed that to the spindle throwing the thumb-bolt an arm is attached which raises and lowers a piece of metal that slides behind the yoke of the latch. When this piece of metal is down it passes over and securely stops the keyhole. At the same time it serves to lock in place the latch and the bolt. The advantage of this form of construction will be readily appreciated by all practical builders. Locks embodying this improvement are manufactured in various styles, adapting them to almost every requirement.

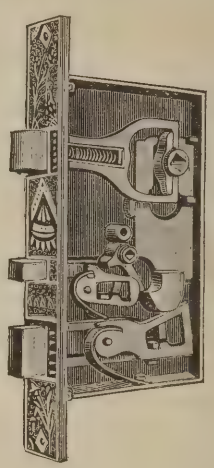


Fig. 3.—Burglar-Proof Door Lock.

Improved Draw Shave.

In the past the size of a carpenter's: oo chest, necessary to contain all the tools commonly used in his work, has been considerable. The tendency at present, however, is to get useful tools into smaller and smaller shape, until it begins to look as though vest-pocket planes and other miniature editions of staple articles would permanently supplant the old-time styles. One of the more recent improvements in this direction is shown in Fig. 4 of the illustrations. It represents what is known in the trade as Robinson's draw shave. The illustration is one-third full size. The tool is designed for amateurs, pattern-makers and all who require a small

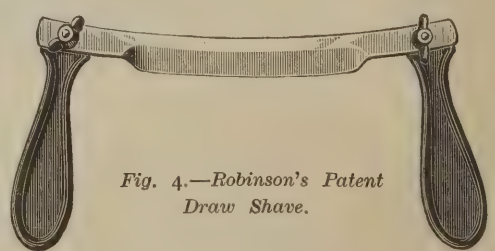
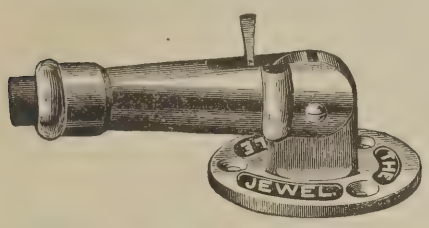


Fig. 4.—Robinson's Patent Draw Shave.

and efficient article of the kind. The handles are of iron and the blade of cast steel. The blade is 6 inches long and the cutting edge is 3 inches. The handles are adjusted by set-screws and may be used at any convenient angle. The tool takes apart and packs in a small pasteboard box, making it convenient in size for carrying in the pocket or putting away in a convenient corner of the chest.

The "Little Jewel" Door Check and Bumper.

The Teetzel Mfg. Co., Detroit, Mich., are the makers of the "Little Jewel" door check and bumper, a general view of which article is shown in Fig. 5. Its construction is so simple that but little description is called for. The bumper is attached by



Novelties.—Fig. 5.—The "Little Jewel" Door Check and Bumper.

screwing the base plate to the door at a distance of 1¼ inches from the floor. The small knob seen at the end is of rubber, which, when the bumper is in the position seen in the cut, acts as a check to prevent the door from moving either way. Within the bumper is a spring that presses a catch into a slot in the base, there being a slot at the lower side and another at right angles to it. The catch is freed by pressing down the knob shown at the left in the cut. When used as a door stop the catch is released from the slot and the movable part rotated until it stands at right angles with the door, in which position the catch engages in the second notch and holds the bar from moving. The bumper, which is made of brass, nickel-plated, is carefully finished and appears to be strong and durable

The "Richmond Triumph" Furnace.

At the present day, when in certain portions of the country heating with hot air is almost universal, and when many large

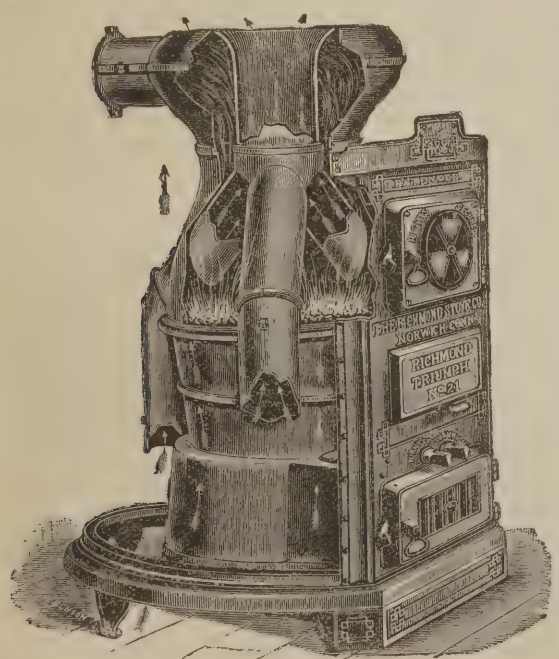


Fig. 6.—The "Richmond Triumph" Furnace.

establishments are devoted exclusively to the manufacture of hot-air furnaces, it is hardly to be expected that any very new or striking features in the arrangement and construction of the apparatus will be discovered. The field has been very thoroughly explored, and what little room there is left for improvement is in the direction of modifications of old and accepted forms, and in new combinations of parts which have already proved their general utility. Notwithstanding these general facts, there are occasionally brought to the attention of the

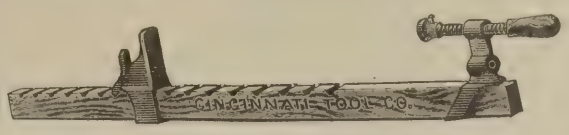


Fig. 7.—General View of Cabinet-Maker's Clamp.

public articles which incorporate a number of new features, and which are of interest on account of their novelty. A new construction in hot air furnaces, just completed and now being put upon the market by the Richmond Stove Company, of Norwich, Conn., is illustrated in Fig. 6 of the engravings. The makers claim for this furnace that it possesses entirely new features, and state that it is the consumation of many years' close observation and experience, combining scientific principles with the best thought and mechanical skill of the age in its construction. The engraving clearly shows some of its leading features. The furnace is equipped with what is described as the "Richmond Duplex" grate, which has been heretofore successfully used in other constructions put out by this company. Its operation is simple and effective, rendering unnecessary the use of pokers or slicing-bars, and reducing the labor of cleaning the fire-pot and removing the ashes to a minimum. The furnace is also provided with a double fire-pot, which is claimed to be a sure preventive against the usual cracking and loss incident to ordinary constructions. It adds greatly to its term of use, and reduces the expense of repairs to the smallest sum. The radiator of this furnace, which is claimed to be entirely novel in its provisions, embodies principles which the makers declare are unknown to any other furnace in a similar form. The construction is such as to present to a fair advantage a varied surface in such relations as to secure the most rapid radiation of its products, and at the same time create a circulation within the walls of the casing that will insure the delivery of the heated air to its place of exit. By examination of the engraving it will be seen that these ends are accomplished by a peculiar arrangement of pipes which carry a portion of fresh air inwardly through the chamber immediately above the fire-pot. Other portions of the air circulate about the exterior of the fire-pot and the smoke-drum in the usual way. Our illustration shows the furnace in portable form. When sent out in this way it is provided with double casings so constructed as to secure a uniform space between the two cylinders, with a circulation of air between them, thus limiting the radiation into the cellar to the smallest amount. Five sizes of this furnace are made, and it is furnished both in portable form and for brick-setting.

Cabinet-Maker's Clamp.

Figs. 7 and 8 illustrate a cabinet-maker's clamp made by the Cincinnati Tool Company, 216 to 220 West Second street, Cincinnati, Ohio. The bar, which is 1⅜ x 2 inches, is made of ash, as is also the handle. The screw, which is of wrought iron, is ⅞ inch in diameter and 6 inches in length, with square thread. It is driven tightly into the handle and then riveted, making it impossible, it is said, for the handle to turn on the screw. The tip of the screw, frame and slide are of japanned gray iron. The dog on the slide is operated by a spring which prevents the slide from working until the position of it is changed by the person using the clamp. The screw may be changed from the upper to the lower hole in the frame, as the nature of the work requires. In case it is wished to make the clamp stronger for any special work, a piece of ⅞-inch wood of any width may be screwed to the under side of the clamp, as shown in Fig. 8. The special point of excellence claimed for this clamp is the quickness with which it can be adjusted.

Fig. 8.—Clamp Specially Strengthened.

New Sliding Door Lock.

Messrs. E. C. Stearns & Co., of Syracuse, N. Y., are putting upon the market a new sliding door lock which in important particulars differs from other articles of the same general character. The bolt forms the pull, thus obviating the necessity of a separate pull. When the bolt is to be used as a pull it is drawn out, but when released falls back into its original position automatically. When it is desired to lock the door, the bolt drives the pull of the strike back into position. When so placed the bolt is securely held and the two doors are properly fastened together. The lock is provided with a folding key, and is made of a very neat pattern in Milan bronze. Other styles are manufactured, including designs in real bronze. The manufacturers state that their object in getting out this lock has been to make one that should compare in durability and finish with other goods, and yet at the same time be so simple in construction and number of parts as to permit its selling at very moderate prices.

Screen-Door Corners.

We illustrate in Fig. 9 a device for fastening corners of screen-door frames, which is put on the market by E. C.

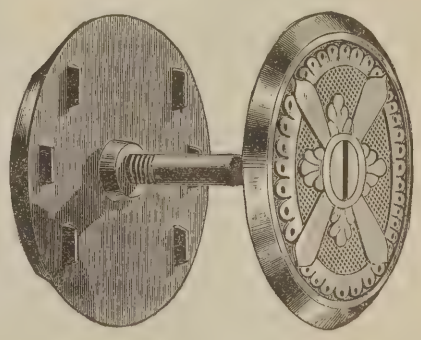
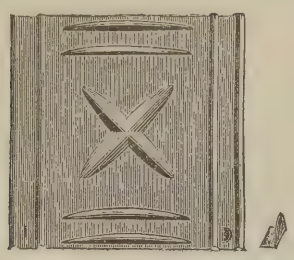


Fig. 9.—Stuart's Screen-Door Corners, Full Size.

Stearns & Co., Syracuse, N. Y. It will be perceived that it is designed to do away with the old-fashioned mortise and tenon. After trimming the ends of the frames, either square or on the miter, they may be fastened together with the patent corner, which is furnished with small wedge-shaped projections, as represented, that enter firmly into the wood as the screw is tightened, forming, it is claimed, a simple, cheap and secure method of fastening frames. They are put up in sets containing six corners and a knob.

New Sheet-Metal Shingle.

Figs. 10 and 11 show the features of a new metallic shingle for roofing and siding, just brought out by Hyndman & Co., 52 and 54 East Second street, Cincinnati. This shingle is manufactured both in black iron, painted, and also of tin plate. The first cut presented shows a single shingle with a loose cleat, which is used for fastening the shingles in place, and also indicates the position of nailing it. The cleats are put in place in proper position, and then the shingles are slipped over them by means



Novelties.—Fig. 10.—Hyndman's Sheet-Metal Shingle, and Cleat for Fastening the Same.

of the slots provided for the purpose. This done, the cleats are folded over and downward, thus fastening the shingle in place. Fig. 11 shows three shingles in process of laying. Iron shingles of this description, we are informed by the manufacturers, are made of the best box annealed roofing iron of No. 27 gauge. Each covers 1 square foot when laid. They are formed into the shape indicated, and the slot shown in the lower left-hand corner is cut by dies. In the right-hand corner there is a depression showing the position for nailing the loose cleat. Both shingles and cleats, the manufacturers inform us, are sent out well painted on both sides with the best metallic paint. The following rules for laying these shingles will be of interest in this connection: Commence at the lower left-hand corner of the roof and bend the shingle 1¼ inches over the edge: and nail. Project the shingle at the same time over the gutter 2 to 3 inches. Then through the lower right-hand corner nail a cleat. Place the slot of the next shingle over the upturned edge of the cleat and force the shingle down securely over the one already laid. Then bend the cleat very firmly against the shingle, thus securing that corner of it without any exposed nails.

Fig. 11.—Method of Laying the Hyndman Shingles.

Continue in like manner through the remainder of the course. Hips are treated in the same general manner as in laying wood shingles or slates. Valleys are first lined with tin or iron, and the shingles are then laid over them in the same general manner as slates or wooden shingles. Messrs. Hyndman & Co. also manufacture a ridge capping for use with these shingles.

Hollow-Handle Screw-Driver.

Many of our readers will no doubt recall an illustration and description of what was called the "Giant Hollow Handle," containing 10 useful tools for mechanics' use, sold by C. E. Jennings & Co., New York, which appeared in our columns some time since. Hollow handles are no novelity, but for the most part as heretofore constructed they have been so small and trifling in character as to be unfit for practical use, the tools amounting to little more than mere toys. Messrs. Jennings & Co. perceived the opportunity of embodying a useful feature of construction in a tool large enough to be of service to the mechanic, and thereupon got up the article referred to. More recently they have carried the same idea a little further, and are now putting upon the market what is designated as a hollow-handle screw driver, arranged upon the same general plan. The handle is large enough, of convenient shape, and of sufficient strength for almost all classes of work. It is provided with three bits, thus admitting instant adjustment to fit different sizes of slots. When the bits are not in use they are carried in the handle of the tool, where they are fully protected as well as kept within convenient reach whenever wanted.

The Ives Sash Lock.

Messrs. Butler & Constant, No. 18 Warren street, New York, are at present directing the attention of the trade to the Ives sash lock, a general view of which is afforded by Fig. 12. This is a new device based upon principles not heretofore used in sash locks. Every motion is positive, and there are no springs or loose parts about it. The special advantages to which the firm direct attention are that it is a sure lock, a burglar-proof lock, and one also that is

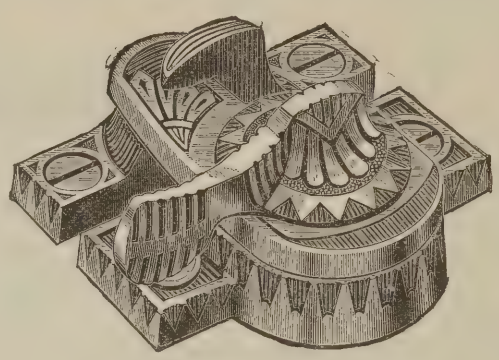


Fig. 12.—The Ives Sash Lock.

rattle-proof. The lock cannot be opened from the outside, and the parts are so arranged that the meeting rails are drawn closely together. It will be seen by the engraving that the moving part of the lock consists of two arms. These work in combination. When the sash is locked the two arms are at right angles to each other. To open, the thumb-piece is turned, which first has the effect of releasing the clamp holding the two rails together. This is accomplished by the time that the two arms come into line. At this point they become locked together, and in completing the circuit the latch is turned back, thus releasing the lock. In locking the sash, of course, the reverse order occurs. The two arms locked together swing around in a straight line until the latch comes against the catch. The outer arm then completes the semicircle, clamping the two rails together and locking the latch immovably. All these movements are accomplished by cams, without the instrumentality of springs. Several varieties are manufactured, from highly ornamental to very plain.

The Perkins Door Check.

The Perkins door check, manufactured by the Portsmouth Wrench Company, 140 Congress street, Boston, Mass., has been recently offered to the trade. The check may either be used as a bolt or as a chain-bolt. The bolt is of ordinary construction, except that the end is enlarged so as to make it T-shaped. Fig. 13 shows the check when used as an ordinary bolt. The socket consists of two projections that extend over the T-shaped end of the bolt and prevent the door from being opened. When used to serve the purpose of a chain-bolt the slotted piece of metal, which is hinged at the end, is pulled out perpendicular to the door, and the bolt is then pushed a little further out, so that the head projects beyond the slot. If the door be now opened the bolt will slide the length of the slot, which, acting as a

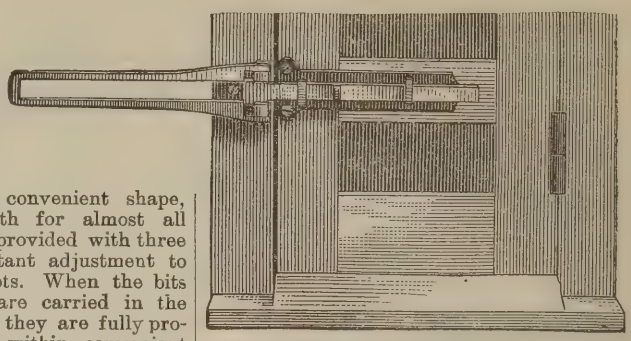


Fig. 13.—The Perkins Door Check.—The Check Used as a Bolt.

chain, will prevent it from opening more than a few inches. Fig. 14 shows the check when used in this way. The Perkins check is manufactured in bronze, nickle and japan.

We are in receipt of a catalogue of the Excelsior and Chicago Lumber Drier, built by Curran & Wolf, Nos. 39 and 41 Franklin street, Chicago. We also have a letter from Mr. C. W. Beal, superintendent of the works, giving some interesting particulars concerning this method of drying lumber and the construction employed. The kilns are built under numerous letters patent, and are in somewhat extensive use in various parts of the country. The illustrations in the pamphlet show kilns which have been constructed by various parties under these patents in different localities. The drying process is effected by hot air, the heating agency being live or exhaust steam. It is claimed that these kilns will thoroughly season hard as well as soft wood, thick as well as thin, and without loosening knots, warping, checking, burning or otherwise injuring the lumber. A dead-air chamber is located over the steam-pipes, which cuts off a large space that is practically useless in some constructions of kilns. The currents are confined close to the pipes, thus forcing the air to pass directly through, between and in contact with the steam-pipes, so that it becomes thoroughly and uniformly heated. Other feat-

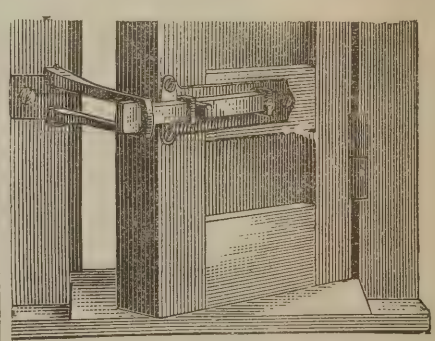


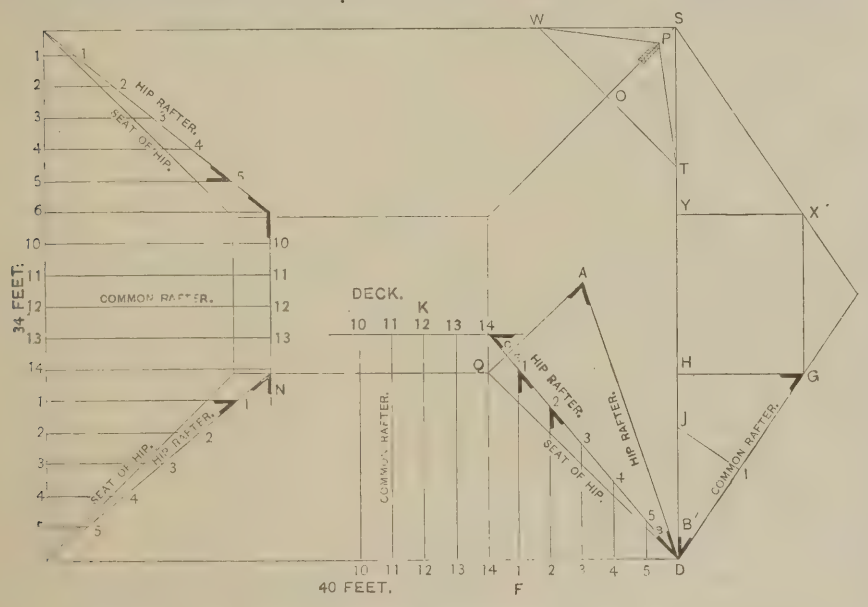
Fig. 14.—The Check Used Like Chain-Bolt.

ures of consideration are a sheet-iron radiating floor separating the hot-air chamber from the drying-room, chimneys or ventilators that are constructed the entire width of the kiln and of such a shape as to give uniform draft through every portion of the drying chamber, and cars specially adapted for handling the lumber for seasoning.

CORRESPONDENCE.

Hip and Jack Rafters.

From L. M. S., *Germantown, Pa.*—In the February issue of *Carpentry and Building* for 1884 there was published a communication from "B. C.," of Rockford, Ill., attempting to show how to obtain the length of hip rafters and also length of jack rafters. Your correspondent evidently imagines that he has mastered the subject, for he asserts that his method is superior to anything that has heretofore been published. I am afraid, however, that if the carpenters of this free country wait until this writer gives them real information on the principles of framing hip roofs they will remain a long time ignorant. It is possible that he understands the question better than his sketch indicates, but if such is the case I am sorry for him that he has been so unfortunate as to misrepresent himself to the public. I will try my hand at the same job. I inclose a sketch to which I particularly direct "B.C.'s" attention. It shows the lengths of hips and their bevels and also the lengths and bevels of the jack rafters. It gives both the plumb-line and the side bevels and the plumb-cut of the jack rafters, as well as the plumb-cut of the common rafters. I have employed the principle here illustrated ever since I have been at my trade, and I commenced it 30 years ago. I have found the rule invaluable. Valleys meets the base, as shown by J. Take the length D J in the dividers, and set off on opposite sides, as shown by S and T. In like manner from the point S, on the line representing the rear of the building, set off the same distance, as shown by S W. Connect W and T. Take the distance I J in the dividers, and measuring from the point O, where the line last drawn intersects the seat of the hip, set it off on that line, as shown by O P. Draw P T and P W. Then at P, as shown, will be the backing of the hip rafter. Other work on different parts of the building is shown in the drawing, which is hardly necessary to describe in this connection, since the parts are the same and the work is virtually a repetition.



Hip and Jack Rafters.—Diagram Accompanying Letter from L. M. S.

are obtained in the same general manner as the hips. Every bevel can be taken from the drawing with a common steel square. First apply a bevel; then, laying it on a board, mark along the blade of the bevel. Then apply the square to the line and you have the bevel on the square. The sketch show a roof 34 x 40 feet. We will first consider the common rafters, one of which is seen from G to D. G to H represents the rise of the roof. To get the length of the hip rafter, take the rise G H, as already mentioned, and square up from the seat of the hip rafter, indicated by Q D on the plan, as shown by Q A. Then from A to D will be the length of the hip rafter. At A is shown the down bevel, and at B, at the opposite extreme, is the bottom bevel. The length of the common rafter is taken from G to D, already referred to. It is laid off on the plan as shown by 14 14. Drawing a line from the point 14 at the top thus established to D also gives the length of the hip rafter. The side bevel of the hip rafter is shown at C. This fits against the deck or the ridge pole.

The lengths of the jack rafters are shown by E F and the other lines of a similar character in the plan. The bevel shown at E is the side bevel of the jack rafter. The bevel of the common rafter at the top is shown at G. The down bevel is shown by B'. The backing of the hip rafter is shown in the upper right-hand corner of the plan. Square from any point in the common rafter, as indicated by I, and continue the line until it

Timber Measurement.

From J. W. J., *Watertown, N. Y.*—A lumber dealer in this city furnished a stick of timber 18 inches square at one end and 6 inches square at the other, 12 feet long. The dealer claimed that the stick contained 156 feet, while the purchaser contended that it contained only 144 feet. A third party, when called upon, made the contents 180 feet. I shall be under obligations for a solution to the question in an early issue of *Carpentry and Building.*

Note.—This question may interest some of our practical readers, and accordingly as to methods of solution we refer it to them. There are no doubt reasons for all of the answers presented above; 180 feet is correct the way lumber is sometimes measured, although we think it would be very unfair in this case to the purchaser. Just what allowance should be made in the case of tapering timbers of this kind is a question which our practical readers can no doubt answer satisfactorily. We shall welcome communications upon this subject.

Origin of a Fire.

From W. J. H.—I had charge of the erection of a frame building 40 x 80 feet in plan, two stories high, the intention of the upper story being for use as a hall. We deadened the floor by nailing cleats on the sides of the joists and then laying a board on the cleats. The joists were 12 inches between the centers. From the top of the board referred to to the top of joists was a space 3 inches deep. We filled this 2 inches deep with mortar composed of lime and sawdust, with about one-sixth part black dirt. The lime was slacked in the usual way and mixed with the sawdust while it was yet hot, and was spread on in that condition. What I desire to know is this: Was there any danger of fire from the lime, and, if so, how long would it take to start before we could have noticed it? The building burned to the ground within seven hours after we stopped work. Some are unkind enough to say that it was the carelessness of the carpenters in the matter of this deadening that caused the fire. I think there was plenty of water used to slack the lime, because it was so wet that we could not do any work in the lower stories on account of the water dropping down from the mortar.

Note.—The question presented by this correspondent is a very interesting one. Without more facts to warrant an opinion than are stated in his letter, we should hardly attribute the fire to the use of the lime as he describes it, and yet it is possible that there were portions of the lime unslaked, which, in the course of a short time after work had been stopped, generated sufficient heat to start the conflagration. Various other explanations of the fire no doubt could be produced, and therefore, as we have already remarked, without corroborative testimony we should be disposed to think the fire was due to some other cause. The fact that lime will start a fire in the process of slaking is not as generally known as it should be. Various accounts have been published of fires created by rising streams, the water from which, penetrating the lower stories of mills or warehouses, has reached unslaked lime and thus set fire to the structures. If our readers have any theories to propound in view of the above communication we shall be glad to hear from them.

Plastering.

From F. A. S., *Minneapolis, Minn.*—In the February issue of *Carpentry and Building* there was published an article on plastering in which a mechanic defines what he considers to be a first-class job of this kind. His article is all right until he gets to a description of the causes of plaster cracking. Certainly a poor foundation will cause plaster to crack, but green framing lumber will not cause it to crack. I believe it to be a universal rule, if plaster cracks, to lay the blame to the foundation or to some defect in the carpenter work. I claim that it is better to use green lumber in the framing than dry lumber, for two reasons: First, if the framing is dry it draws water from the plaster too fast, and the framing in turn becomes as wet as if the lumber had been picked out of the river. In the second place, if green lumber is used in the framing, that effect will not follow and the plaster will not lose its water so far as to be injurious. Green timber holds nails better than dry, which is another advantage. If a nail is driven into a green stick it does not tear the grain, and when the stick becomes dry it will be found almost impossible to draw the nail out. I would like to have others give their experience in this direction.

Hoppers.

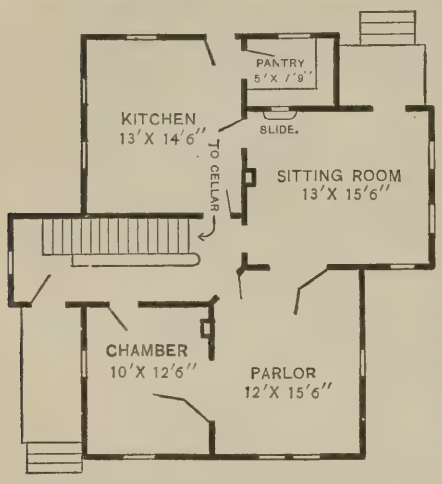
From R. C. W., *Galveston, Texas.*—I am a beginner at the carpenter's trade, and a recent subscriber to *Carpentry and Building.* I desire to be informed of the meaning of the word "hopper" and the "flare" of hoppers as the terms are used in the paper.

Answer.—If our correspondent should visit a mill or should have the opportunity of inspecting any of the various forms of portable mills in common use he would notice a flaring receptacle at the top into which the grain or other material to be ground is poured. This is commonly called the hopper. We are not informed of the derivation of the word, but the definition as given in Webster and other dictionaries is in accordance with this explanation. A definition of the word is in the following terms: "A wooden trough through which grain passes into a mill by jolting or shaking." The sense in which the term hopper has been employed in this journal in the discussion of certain problems of design and construction is that of a flaring wooden construction in general shape resembling the hopper of a mill. The flare has reference to the variation from a square or rectangular box shaped construction. The flare is more or less as the hopper deviates more or less from the form of a box. The degree of flare, of course, must be considered in the methods pursued in obtaining the lines to which to cut the several pieces composing the hopper. Another name that applies to

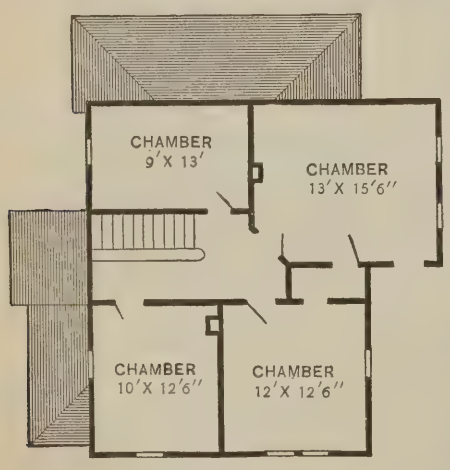
the same kind of work is "splayed." This term refers to the angle or flare of the work, and accordingly we say a window jamb, for example, is "splayed." The problems in hopper bevels and in splayed work are for the most part similar, and in many cases are identical. Similar principles are at the foundation of hip-rafter problems.

Farmhouse Plans.

From W. S. W., *Washington, Iowa.*—Inclosed I send a plan for a country house, in which I think some of the readers of *Carpentry and Building* will be interested. As I work considerably on farmhouses, I have watched with great interest the different plans of houses presented in back numbers of the paper. I am obliged to say, however, that there are very few, if any, so far published that would meet the wants of this section of the country. Of course some of the plans are made use of here, but, notwithstanding, they are open to serious objection. As a general thing the farmers in this region do not wish to put more than $2000 into a house, and many of them desire to restrict the investment to $1200, and yet they want a parlor, sitting-room, kitchen, pantry and bedroom on the lower floor. These are almost indispensable in anything that bears the name of a good house. Now if all this is had on the first floor and the house is carried up two stories, it results in a structure that is too expensive; hence many build on a one-story addition for kitchen and pantry. There are two important objections to this method, however. One is that it places the kitchen too far away from the front stairs, there being no back stairs, and the other is that the flue in the one-story addition will seldom draw well, nor is it as safe from fire as a chimney properly built. In the plan that I present these objections, I think, are fairly overcome. The rooms are all convenient to the stairs, and the flues are both run out at top of the main house. A building to the plan shown would not cost in this section of the country more than $1500 or $1600. The plan submitted differs very much from anything I have seen, and if any of your readers see objections to it I hope they will make them known. That part of the wall which extends out past the main building I would carry up just high enough to give good headroom for the stairs. I would make a hip roof with a deck on the main house. If any of the architects who read this feel disposed to prepare elevations or a perspective view of a house constructed to this plan, I shall be very glad to see them, and I have no doubt that such drawings would interest a very large class of readers.



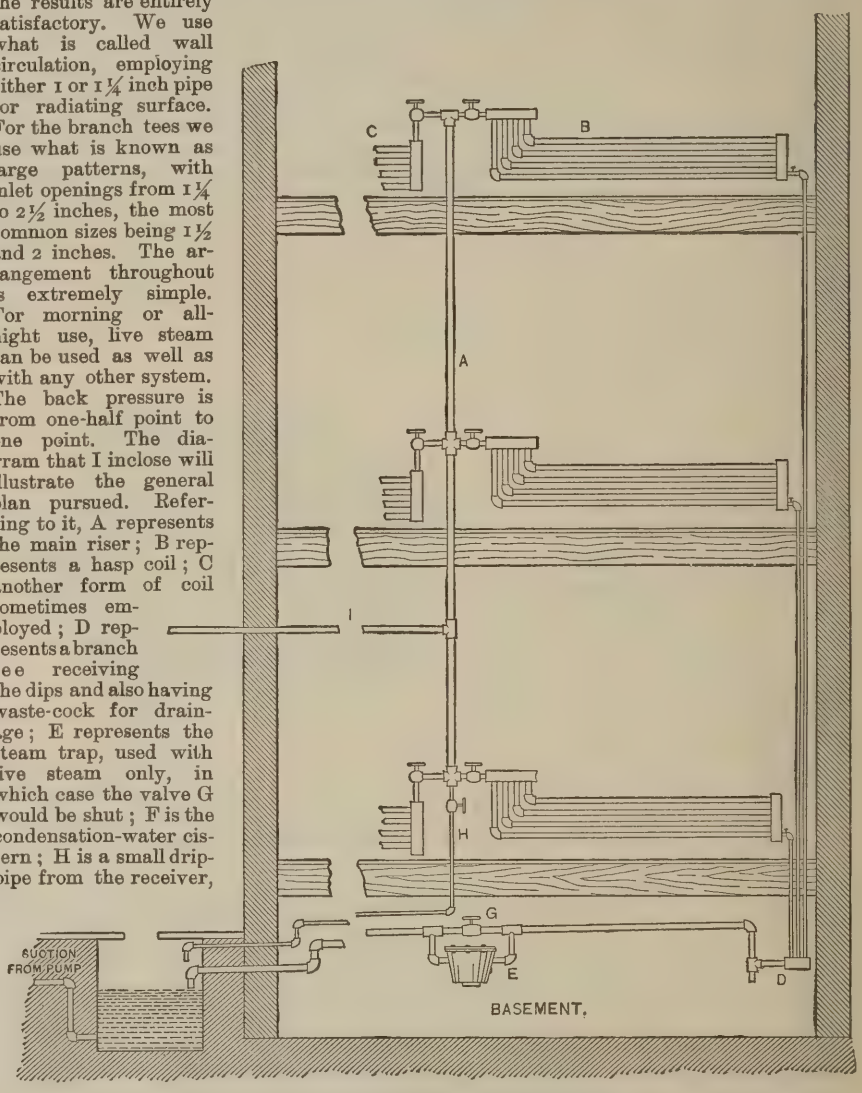
Farmhouse Plan, by W. S. W.—First Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.



Second Floor.—Scale, $\frac{1}{16}$ Inch to the Foot.

Heating with Exhaust Steam.

From W. C. W., *Grand Rapids, Mich.*—Nearly all the large factories in this vicinity are now warmed with exhaust steam, and even in factories of the very largest size the results are entirely satisfactory. We use what is called wall circulation, employing either 1 or 1¼ inch pipe for radiating surface. For the branch tees we use what is known as large patterns, with inlet openings from 1¼ to 2½ inches, the most common sizes being 1½ and 2 inches. The arrangement throughout is extremely simple. For morning or all-night use, live steam can be used as well as with any other system. The back pressure is from one-half point to one point. The diagram that I inclose will illustrate the general plan pursued. Referring to it, A represents the main riser; B represents a hasp coil; C another form of coil sometimes employed; D represents a branch tee receiving the dips and also having waste-cock for drainage; E represents the steam trap, used with live steam only, in which case the valve G would be shut; F is the condensation-water cistern; H is a small drip-pipe from the receiver, and I the main supply-pipe. The sketch shows one of the simplist forms of piping in use.



Heating with Exhaust Steam.—Diagram Acccompanying Letter From W. C. W.

For estimating the size of main pipe and branches the following rule is safe: Compute the amount of heating surface required for the entire building and also for each section. For sections containing 200 feet of 1-inch pipe or less use 1¼-inch feeder. For sections containing from 200 to 300 feet use 1½-inch feeder. For sections containing from 300 to 500 feet use 2-inch feeder, and for sections containing from 500 to 800 feet use 2½-inch feeder. The main pipe need not equal the area of all the branches. For 1500 lineal feet of 1-inch pipe use 3-inch main. For 2000 lineal feet of 1-inch pipe use 3½ inch main. For 3000 feet of 1-inch pipe use 4-inch main, and for 4500 feet of 1-inch pipe use 5-inch main. Use only open-way or angle valves of good opening. For very long runs increase one size. On main exhaust leading to the roof place a back-pressure valve set at 1 pound. In conclusion, I would say that the radiating surface necessary where exhaust steam is used is only about one-tenth more than the requirements of ordinary low pressure. The above remarks have been written upon the supposition that I am addressing some one partially acquainted with steam work, and therefore I have omitted many little details regarding grade of pipe, air vents and other minor items which always help to constitute a perfect system.

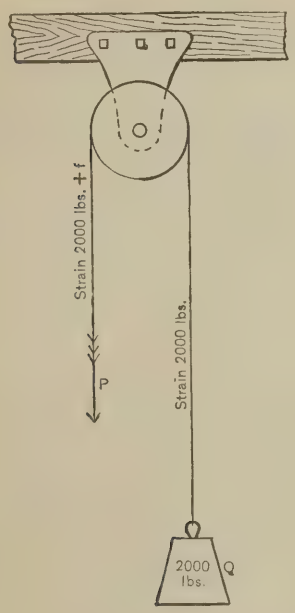
Prairie Houses.

From I. B. W., *Emerson, Kan.*—I am greatly pleased with the competitions for house plans which have been published in *Carpentry and Building*, since they give us fellows on the frontier some idea of what is considered a comfortable house for the East, where all kinds of building material are at hand. They suggest many valuable ideas, and therefore are highly appreciated. I presume, however, that many Western readers like myself would be glad if some of the space of *Carpentry and Building* was devoted to suggestions and plans of houses adapted for construction on the Western prairies. In many localities, like Western Kansas, for example, the only material available is Michigan pine lumber at $25 per 1000 feet, and building paper, out of which to construct a comfortable, somewhat lasting and reasonable-in-cost dwelling. This is one of the problems that frontier mechanics are constantly called upon to solve. Of course, as our people become better able financially they build different and better houses, but the vast majority of them at the outset are limited to the conditions I have named. A general discussion of what constitutes a comfortable and creditable house under the circumstances I have described would in the course of time add much to the general appearance of our country and greatly to the comfort of our people. The prevailing

strong winds of this locality demand low, well-braced buildings. The piercing prairie blasts make a free use of common building paper a necessity, both for shutting out the cold and keeping out the sun and heat. There is plenty of room for American genius to exercise itself in this direction, and I hope the subject will have the attention of some of the practical readers of *Carpentry and Building*.

Strains on Derricks.

From D. P. P., *Brooklyn, N. Y.*—The answer to the question proposed by "G. F.," which was whether there is more strain on a derrick when raising a given number of pounds with a single rope than when the same work is undertaken with a double block and tackle, is that there is a material difference. This being said, however, it still remains that many people do not observe it. I will try to explain the reasons fully for the benefit of your correspondent and other interested readers. Supposing that a load of 2000 pounds is to be raised by a single rope that is carried over a pulley fixed to a beam, as indicated in Fig. 1. Under these conditions the force P on the other end



Strains on Derricks.—Fig. 1.—Single Pulley.

of the rope must be exactly 2000 pounds in order to sustain the load Q in equilibrium. It must be a little more than 2000 pounds in order to cause the load to move upward and to overcome the friction of the pulley and of the shaft and the stiffness of the rope. These last-named resistances, in order to reduce the matter to the shape of a formula may be indicated by f. It is obvious now, since P and Q exert a strain in the same direction, that the supporting-beam must sustain a strain of $P + Q + f = 4000$ pounds $+ f$. On the other hand, if there be an arrangement of the character shown in Fig. 2, which represents a double block and tackle, the same load is held up by two ropes, a b, each conveying to the beam a strain of 1000 pounds. To hold the load in equilibrium the force on the other end of the rope must be exactly 1000 pounds—that is, it must be enough to balance the strain of the rope b. In order to move the load it must be 1000 pounds $+ f^1$. Now, these three strains all have the same direction, and produce a combined strain on the beam of $1000 + 1000 + f^1$ pounds. That is, if we maintain the values as above, $\frac{Q}{2} + \frac{Q}{2} + P + f^1 = P + Q + f^1 = 3000 + f^1$ pounds. It is obvious that when this is the case the strain on the beam is nearly one-quarter less than in the first case. The force for retaining the load is only one-half as large, but, on the other hand, the load raises only one-half as rapidly. This will be readily understood when it is remembered that in order to raise it 1 foot it is necessary to shorten both ropes, a and b, 1 foot—that is, pulling the rope a down 2 feet. With a single rope the load raises a foot for each foot of distance that the other rope is pulled down. If, furthermore, there be more pulleys arranged, something as shown in Fig. 3, the load will be sustained on six ropes, each conveying a strain

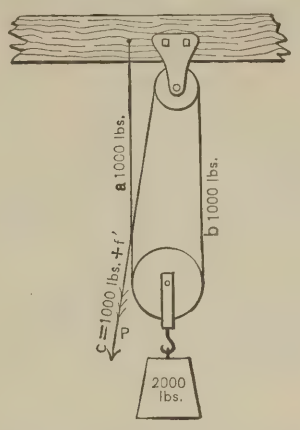


Fig. 2.—Double Block and Tackle.

to the beam of one-sixth of 2000 pounds. To make the load move in this case the force P must overcome the strain in the last rope and the resistance. In other words, it must be $P = \frac{2000}{6} + f^2$ pounds. This strain is also conveyed to the beam, which has now to sustain only a weight of $6 \times \frac{2000}{6} + \frac{2000}{6} + f^2$ pounds. That is, $P + Q + f^2 = 2333\frac{1}{3} \times f^2$ pounds. This is still less than in the last case. The force required to raise the load is only one-sixth of the same, plus the force to overcome the resistance in the apparatus.

By adding more pulleys in the above manner the required lifting force can be still more decreased and the strain on the beam correspondingly diminished. There is a practical limit, however, to the extent to which this may be carried. As the resistances f, f^1, f^2, &c. increase in proportion to the number of pulleys, the additional force to be applied to overcome this resistance will eventually annihilate the gain. The theoretical formula, disregarding the frictions, for the arrangement shown in Fig. 3 is $P = \frac{Q}{2^n}$

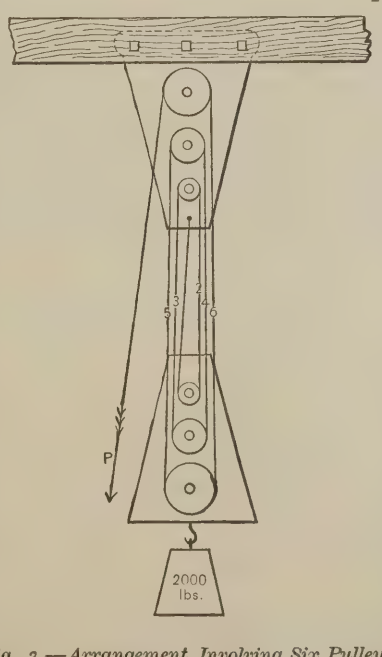


Fig. 3.—Arrangement Involving Six Pulleys.

There are still other arrangements by which the required lifting force, and consequently the strain on the supporting beam, may be decreased, but, as the above illustrations answer the question of your correspondent, it is unnecessary to describe them. In conclusion, it is to be stated that the strains on the supporting beam or derrick are equal to the combined force of the weight of the load, the required lifting power and the additional power to overcome the resistance in the apparatus. Thus the strain will always be greater than the load, and it will be greatest when only one rope and one pulley are used. This matter assumes another and more complicated form when the forces are not, as here supposed, all vertical, as, for example, in railroad cranes. This explanation is, of course, familiar to all who have had the opportunity of studying mechanics. It may perhaps be more useful to those who have had to obtain their knowledge by self-education.

Passenger and Freight Stations.

From P. S.—I wish some of our architectural friends could be induced to publish in *Carpentry and Building* a few designs for cheap passenger and freight stations with agents' rooms over waiting-rooms and offices. Some improvement on the present style of brown barns used for the purpose is desired. Tell them to throw a little Queen Anne into the gables and roofs, and let the whole building have a squatty, comfortable look. They might also extend their efforts so as to include section laborers' cottages. The conditions existing in railway buildings need overhauling, I think, even more than farm-houses. Stations are of necessity utilized by the traveling public, and they are gazed at and inspected by hundreds of spectators who naturally compare ill-designed buildings with the neat little edifices of the class which they have seen elsewhere. The comparison in many cases, to put it mildly, is odious.

Note.—Similar suggestions have reached us in the past. We shall be glad to publish such designs as this correspondent asks for, if any of our readers will supply them. The Editor will be glad to correspond with any one who has on hand a study of the character named, or who is disposed to undertake its preparation.

Dry Rot.

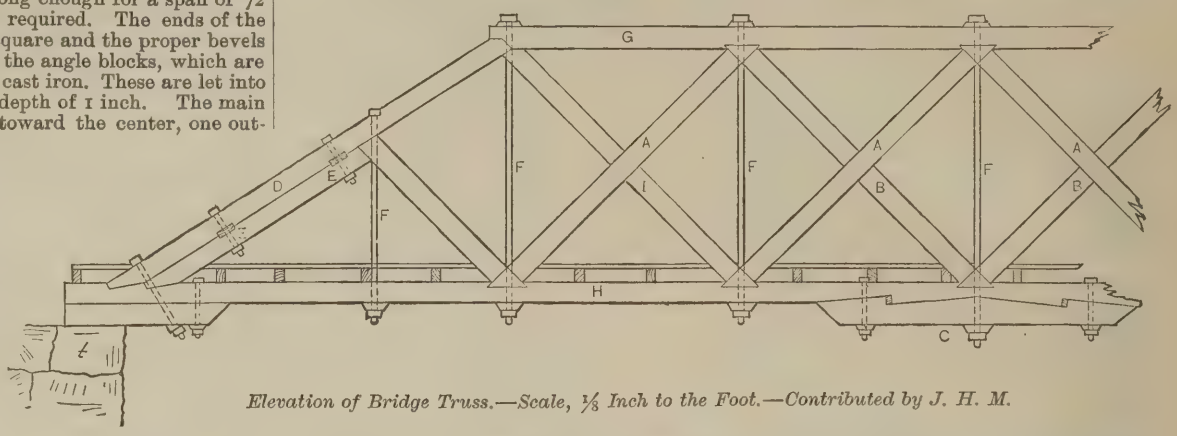
From P. W. L., *Ballietsville, Pa.*—To prevent the dry-rotting of floors I would suggest coal ashes and cinders. Fill up the spaces between the joists to within 3 or 4 inches of the floor. This will prevent the cinders or the soil coming in contact with the floor. I have laid floors in this way that have stood the test of a dozen years. Upon examination I find them in almost as good condition as when they were laid. If a circulation of air can be obtained it is well to do so. Floors are better with air than without it. However, if the floor were laid directly in contact with the ashes it would not rot as readily as though the ashes were not present.

Relative Strength of Nails.

From C. H. H., *Bridgeport.*—Your correspondent, "G. A. S.," can, if he will, decide the question for himself, which of two nails driven under the conidtions he names is the strongest, by the following method: Drive two common tenpenny nails in the general manner he describes, one into a block 2½ inches deep, and the other into an inch oak board 2½ inches. Bore a hole in the hammer handle 1½ inches from the end. Procure a hickory pole 6 feet long. Bore a hole in the floor and stick the pole into it. Hook a spring scale into the hammer handle and attach the other end to the pole. Fasten the block securely to the bench and hitch on to the nail which has been driven into it with the hammer claws. Bend the pole so as to get the necessary strain. Keep both eyes on the dial plate of the scales and note the points indicated when the nail starts. When this has been done, chalk it down on the bench and repeat the experiment with the inch board into which also a nail has been driven. Fasten the inch board to the bench and connect the spring pole, as before, to get the necessary strain. Watch the dial plate and again note on the bench with chalk the weight it indicates when the nail starts. Chalk down the lesser under the greater and subtract, thus showing the actual difference between nails under the conditions named.

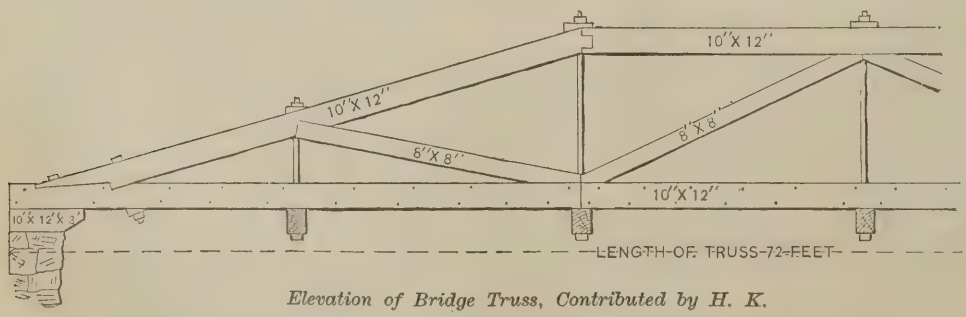
Bridge Truss.

From J. H. M., *North Andover, Mass.*—In the March number of *Carpentry and Building* your correspondent "R." desires information with regard to a bridge shown by a sketch printed in connection with his letter. I shall not enter into any critical discussion of the design shown, but will simply inclose a sketch of a truss that I think will be strong enough for a span of 72 feet or more if required. The ends of the brace are left square and the proper bevels are made upon the angle blocks, which are of hardwood or cast iron. These are let into the chords to a depth of 1 inch. The main braces all lean toward the center, one outside and one inside of the center braces. The latter are single and bear in the opposite direction from the center toward the ends. All three are bolted together at their intersections. The lower chords in each truss or at each side are three in number, and are bolted together. Hardwood keys 2 inches thick, 6 inches wide and 12 inches long are inserted on each side of every joint, and at certain intervals even where there are no joints. These keys are let into the chords about ¾ inch on each side, leaving ½ inch between the chords for free circulation of air. The long end braces are 12 x 12 inch section; the upper chord is of the same dimensions. If it should be necessary to splice the upper chord this work should be accomplished with a scarfing block similar to the one shown at P in the lower chord. It will be stronger than a whole stick of timber. Referring to the cuts, A represents the main braces, B the counter braces, D the long end braces, C the scarfing block, E the keys, F the truss-rod, 1¼ inches in diameter. G represents the upper chord and H the lower chord.



Elevation of Bridge Truss.—Scale, ⅛ Inch to the Foot.—Contributed by J. H. M.

From H. K., *San Josie, Cal.*—I inclose a drawing representing a truss for the bridge which has been under discussion in *Carpentry and Building* for a short time past. I think it will stand all that would be required of it. I have marked on the drawing the sizes of the timbers that I would recommend to be used. The chords are to be in three pieces and securely bolted together at suitable intervals, thus enabling the builder to break joints. The feet of the braces are framed into the chord 1 foot from the ends, and are fastened with inch bolts. The cross-ties are made of 8 x 12 timber, and are placed 12 feet apart. The plank should be 4 x 6 inches, instead of common 2-inch plank, very commonly employed. I have nothing to say with regard to the design of truss your correspondent originally sent in, and which he found unsatisfactory, further than to fully agree with the Editor's remarks thereon. It is, as you say, altogether inadequate.



Elevation of Bridge Truss, Contributed by H. K.

Arrangement of Rooms.

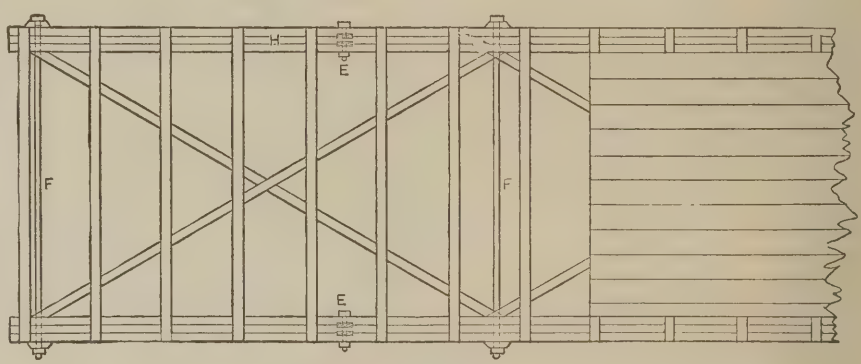
From D. W. S., *Fergus Falls, Minn.*—I have some comments to offer concerning the plan of a 10-room farmhouse published in the April number of *Carpentry and Building*. It seems to me that the dining-room is in rather an unhandy place. The hired men in coming to their meals would have to pass through the kitchen and pantry. Now, as the kitchen is rather small for a farmhouse, it would seem that the men would be greatly in the way in passing through it. They would be likely to be passing just at those times that the women of the household would be using the same passageway in carrying victuals and dishes from the kitchen to the dining-room. Of course it is possible for the men to enter through the conservatory, or they might go around through the front hall, but as both of these would probably be carpeted they can scarcely be considered proper entrances for men who have been at work in the fields or about the barn. I would suggest that the mother's room be used as a dining-room. Then in this case the men would come in through the back veranda, through the washroom, without passing through the kitchen at all. The room marked dining-room would be more suitable for the mother's room, as it opens both into the sitting-room and conservatory.

Note.—We are not authorized to speak in defense of the plans above criticised, but we venture the opinion that it is possible their author did not anticipate using the regular dining room for the farm laborers. In many sections of the country, even on farms, the family and the laborers dine apart. The author, in presenting the plans, gave substantial reasons for locating the mother's room as it is. Much of this would have to be sacrificed by the change above mentioned. We shall be glad to hear from "Farmer's Daughter" concerning the points which this correspondent raises.

Glass Cutter.

From C. R., *Albany, N. Y.*—Please inform me where I can obtain a first-class diamond glass cutter. I want a tool especially for plate glass.

Answer.—Our correspondent can probably obtain what he requires by corresponding with any establishment dealing in painters' and glaziers' supplies. Any of the plate-glass establishments would no doubt recommend him to a source where he could obtain an excellent article for the purpose specified, if, indeed, they could not supply it direct. We are under the impression that Messrs. F. W. Devoe & Co., corner William and Fulton streets, this city, can also supply the tool.

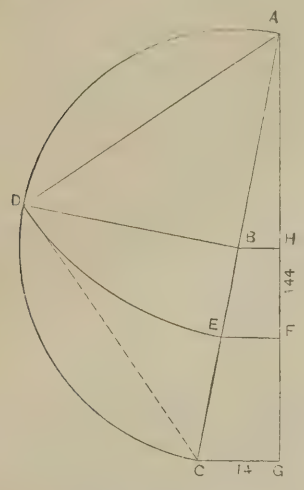


Plan of J. H. M.'s Bridge.

Problem in Board Measure.

From CRAX, *Buffalo, N. Y.*—There have been so many answers to the problems in board measure propounded by "H. I. R." and "W. B. M." that another communication on the subject may seem superfluous, but there may be a few knights of the jack-plane and handsaw that, like myself, are generally pretty well tired out after ten hours of hard work, and when the evening pipe and paper are both finished feel more like going to bed than tackling two or three columns of such bewildering information as the aforesaid problems have called out. To the average mechanic a mathematical demonstration executed in the highest style of the art or science, is such a tangled maze of x's and y's, +'s and −'s, with a few figures sandwiched in here and there in such unexpected positions, that he rarely has the courage to work his way through it, and, when he does try to "figger" out the confounded thing, generally gets stuck about the middle, and gives it up with a profound feeling of disgust for the problem, and oftimes for them "algebra fellers," because they don't make it plainer. In the problems under consideration it seems to be pretty generally conceded on all sides that the areas of similar figures are to each other as the squares of their homologous sides (the boys in the shop were on a still hunt for about a week after the meaning of that word homologous), and we will now try and show this in a such a way that the boys can take their compasses and a piece of board at noon and "figger" it out

as quick as the fellow with the pencil and an unlimited procession of x's and y's. Draw the triangle A C G to scale and bisect one side, as A C, at B, with the point B as a center; describe the semicircle A D C; draw A D; with one leg of the compasses on A, set the other on D and lay off A D on A C to E;



Problem in Board Measure.—Fig. 1.—Solution by Construction.

draw E F parallel to C G, and the line E F will divide the triangle into two equal parts. Now, that's easy enough to do, but we haven't told why we did it, and, as this is the principal part of the problem, we will do so. If the areas of two similar figures are proportional to the squares that can be erected on the similar sides of said figures, it follows that, if the area of the triangle A E F is equal to half the area of the triangle A C G, the area of a square erected on the side A E must be equal to half the area of a square erected on the side A C; so, in order to find the length of the side A E, we must find the side of a square whose area shall be half that of of a square erected on the side A C.

Now, thanks to the labors of Pythagoras some few hundred years ago, more or less, we know that the sum of the squares of the base and altitude of a right-angle triangle is equal to the square of the hypothenuse; consequently, the square erected on the diagonal of a square is equal to the sum of the squares erected on any two of its sides. We will, therefore, assume the side A C to be the diagonal of a square the side of which we wish to find; we then draw the semicircle A D C, because the diagonal of a square is also the diameter of a circle in which the square can be inscribed, and by erecting B

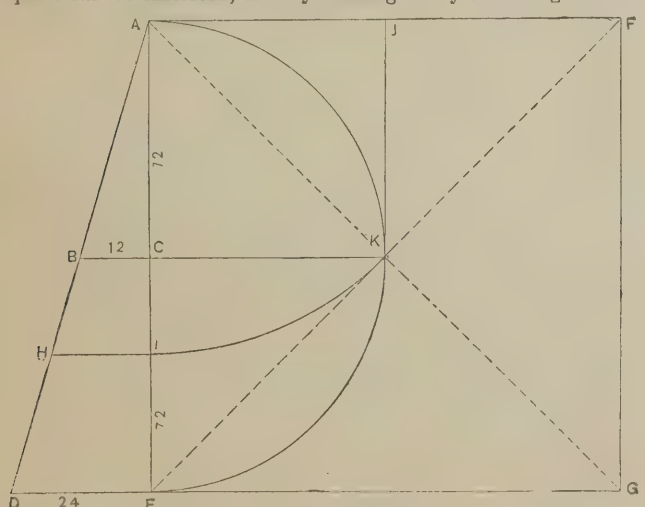


Fig. 2.—Application of the Same Principles to a Trapezoid.

D (which is half of the other diagonal) perpendicular to A C we find the corner D and the side A D of the inscribed square, whose area must be equal to half the area of a square erected on its diagonal A C; consequently, we make A E equal A D; draw E F parallel to C G, and the triangle must be equally divided; likewise B H drawn parallel to C G will divide the triangle A E F into two equal parts; the operation may be performed on the side A G with the same result, or on any side of any shaped triangle. From this example we can deduce a very simple formula, as follows: Multiply the hight A G by .7071 = 144 × .7071 = 101.8224 = A F; whole area of A C G, divided by A F = $\frac{1008}{101.8224}$ = 9.8997 = E F; 144 − 101.8224 = 42.1776 = G F. Proof, $\frac{E F + C G}{2}$ = $\frac{9.8997 + 14}{2}$ = 11.9496+ mean of E F and C G; 42.1776 × 11.9496+ = 503.97544916, which is as near as we can calculate the half area of A C G without a greater number of decimal places. The number .7071 is a constant or multiplier between the diameter of a circle and the side of a square which can be inscribed in that circle; hence its application in the foregoing problem.

The consideration of the trapezoid problem requires different treatment from the foregoing, although the principle is the same. We first draw the trapezoid to scale, Fig. 2 and continue the sides till they meet, joining a triangle, A D E, the portion D B C E representing the trapezoid which we propose to divide equally. It is evident that if we divide the whole triangle into two equal parts, as at H I, the part H I D E will be greater than half of B C D E by one-half of the added triangle A B C, and in order to obtain the correct length to lay off on A E we must find the side of a square the area of which is equal to A C J K, plus half the remainder of A E F G. To do this we draw the half diagonal P G K, Fig 3, which divides the remainder of the large square into two equal parts, after the small one has been deducted. We now add one of these parts to A J C K by extending J K to H, and converting the triangle K H G into the rectangle J L H I the rectangle A L E I is now equal to the square the side of which we wish to find. To do this extend E A to M, making A M equal A L, bisect E M at N and describe the semicircle M O E; the distance A O will be the side of a square, A O P Q, equal in area to the rectangle A L E I, and giving the distance A Q. Draw R Q parallel to D E, and B C D E will be equally divided. The line A O is a mean proportional between M A and A E—that is, multiplied by itself it gives a product equal to that obtained by multiplying M A and A E.

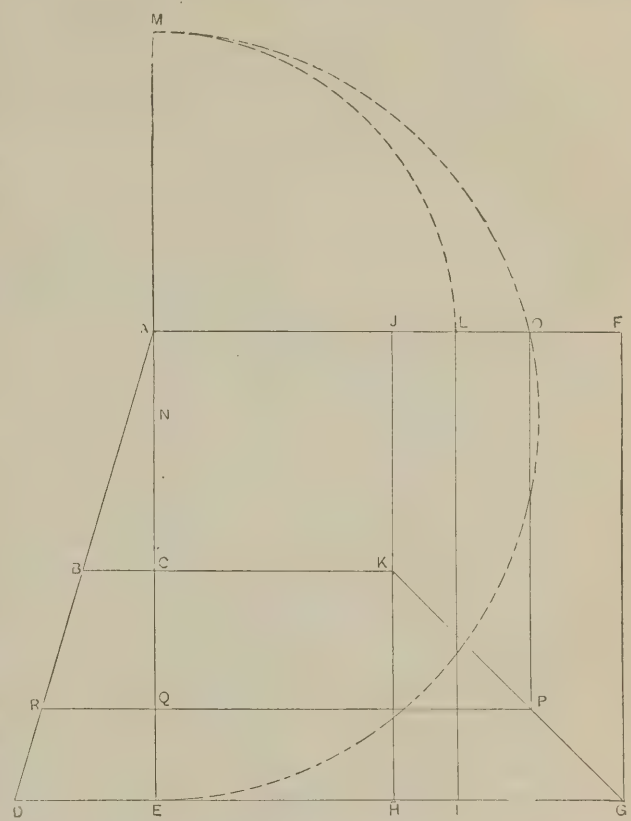


Fig 3.—Finding the Side of a Square the Area of Which is Equal to A C K J of Fig. 2, Plus Half the Remainder of A E F G.

Chisel-Pointed Nails.

From L. E., *Bangor, Pa.*—In reading the January number of *Carpentry and Building* I find that some correspondent is asking about chisel-pointed nails. Such nails were on exhibition at the Centennial Exhibition, Philadelphia, or else at the permanent exhibition which succeeded it, and this fact may enable your correspondent to obtain the address of the makers.

Note.—Our correspondent's inquiry with reference to chisel-pointed nails was proposed for the purpose of learning of a nail which might be driven with less damage to the texture of the wood which it penetrates and less danger of splitting than pertains to the use of the ordinary cut nail. While the chisel-pointed nail is much better than the ordinary blunt article, we think that the sharp-pointed wire nails made, for example, by the HP Nail Company, Cleveland, Ohio, are still more desirable for use. A wire nail being of the same diameter or thickness from point to head has the advantage of the maximum amount of friction against its sides, thus holding the work in the securest manner possible. The absence of the wedge principle which pertains to all other nails makes it possible to drive wire nails without danger of splitting.

REFERRED TO OUR READERS.

Clark's Picket Cutter.

From Louis Miller, *Arcadia, Mo.*—I desire to learn where I can obtain cutters for a picket pointer. The name on the machine is "J. W. Clark, patented April 11, 1871, Columbus, Ohio." If any reader of the paper can give me this information he will confer a favor.

Cabinet-Maker's Bench.

From C. R., *Omaha, Neb.*—If some practical reader of *Carpentry and Building* will contribute the drawings and descriptions of a cabinet-maker's bench, with tail-screw, he will confer a great favor.

Raising a Barn.

From F. P. C., *Troy, Pa.*—I would like to have the opinion of some of the readers of *Carpentry and Building* as to the best method of raising a barn of 60-foot span. The posts are 20 feet high, the beams run the full length of the span and are to be raised above a basement of 10 feet. The barn in question is 60 x 100 feet in plan. There are two sets of purlins above the first posts, and

the construction employed is a little out of the line of barn building in this locality. I desire to inquire if this frame can be successfully raised with gin poles. How should they be arranged to obtain the most power?

Hand-Sawing Machine.

From E. E. O., *Wakefield, Mass.*—I wish to inquire, through *Carpentry and Building*, if the Wells hand-sawing machine is still in the market, and, if so, where it can be bought? The machine I have in mind is small in size, and is arranged so as to secure it to a work-bench. The saw has a swaged tooth.

TRADE NOTES.

Messrs. J. & R. Lamb, 59 Carmine street, New York City, have issued four handsome hand-books relating to their goods. They cover a very wide field, embracing stained glass for domestic and church use, hand-carved woodwork in oak and other hard-woods, metal work in bronze, polished brass, wrought iron and sterling silver, embroideries and banners for ecclesiastical purposes, and church furniture in general. The books are profusely illustrated by original designs, and give valuable suggestions to intending buyers. This firm have had an uninterrupted experience of 27 years in the peculiar field in which they are working, and their assortment of goods is probably unrivaled. We understand that these hand-books are sent free to all applicants. The one on metal-work contains 32 pages; that on stained glass 40 pages; the one on church embroideries, banners, &c., 32 pages, and the one on church furnishing also 32 pages. These pamphlets cannot fail to be of interest to architects and builders in general.

We have received from the W. F. & John Barnes Company, Rockford, Ill., a large poster, containing illustrations of machines selected from the large stock of the company as being especially suited to the wants of builders. The circular shows among others a hand circular rip-saw, foot-power former and scroll-saw and a hand tenoner. On the opposite side of the poster a general view of the factory of the company is shown, with several interior views. The margin is illuminated by cuts showing forms produced by some of the machines which the company make.

The catalogue issued by Charles A. Strelinger & Co., No. 86 Woodward avenue, Detroit, Mich., contains upward of 150 pages devoted to wood-working tools used by carpenters, carvers, millwrights, pattern-makers, amateurs, &c. Almost all the special and staple tools which enter into a wood-worker's kit are herein illustrated and priced. The book has been prepared with unusual care, and it contains much information that is valuable to mechanics in any of the lines mentioned. Especially is this the case with those who are so situated as to be deprived of the advantages of a well-assorted stock from which to select. It is scarcely necessary to enumerate the classes of goods included in this book. Almost everything that a mechanic needs is presented, including many auxiliaries, embracing such tools as are on the border line between the wood-worker and the machinist's trade. A complete assortment of drafting tools is presented, also iron vises, steel letters and figures for marking tools, reamers, pattern letters, hand drills, lathe heads, &c. The same firm carry a full line of builders' hardware, upon which they ask those engaged in building to send for prices. Many of the tools shown in the catalogue may be sent by mail and others can be forwarded by express.

A new catalogue embracing 110 pages of handsomely printed and thoroughly illustrated matter has been issued by Messrs. C. E. Jennings & Co., with offices and ware-room at No. 69 Reade street, and 87 Chambers street, New York. The factories of this company are located at Chester, Conn.; Yalesville, Conn., and Hinsdale, N. H. The goods shown are mechanics' tools and hardware specialties. Of mechanics' tools, in which it is to be supposed our readers are particularly interested, there are several items that deserve particular mention. Among these is the firm's round-lip-pattern auger bits and other special styles of auger bits, put up in boxes, each box holding a set of 13 bits. The boxes are so constructed as to hold the bits securely in position and at the same to occupy a minimum of space. This is a great convenience to mechanics, since it permits the bits to be put away immediately after use. The boxes are made with dovetailed corners, and are well adapted for the purpose. Similar boxes are provided for the Merrill & Wilder socket firmer chisels, which this company also manufacture and sell under guarantee. Among the new tools shown may be mentioned Smith's automatic steel-jaw bit brace and Smith's "Excelsior" clamp-bit brace. These tools embody new and desirable features. There is also shown Robinson's draw shaves, an illustration of which may be seen in another part of this issue. Many staple tools are also shown. The catalogue throughout abounds in those things concerning which enterprising builders and mechanics are desirous to be informed.

We have received from Beecher & Smith, with office and manufactory at 48 and 50 Long street, Cleveland, and branch house at 1120 Washington avenue, St. Louis, a copy of the new edition of their illustrated catalogue. The book presents a very complete and satisfactory description, with illustrations, of the "Beecher" furnace. The furnace in its design, construction and setting embodies a number of novel principles, and its successful working, which is attested by a long list of names published in this pamphlet, renders it worth the attention of architects and builders. The pamphlet, which is sent to all applicants, so thoroughly describes the features of construction and shows its advantages so completely that lengthy description upon our part is unnecessary.

The H. W. Johns Mfg. Co., 87 Maiden Lane, New York, inform us that they were awarded medals of the first-class at the Cotton Centennial Exposition, recently closed at New Orleans, for their full line of goods, including colors in oil, asbestos roofing, asbestos building felt, boiler coverings, &c.

We have received from the Peerless Brick Company, Pa., a bound copy of a book recently issued by them containing diagrams of modeled ornamental and colored bricks of their manufacture. Many of the designs contained in this work are the same as have appeared in former editions, but a number of new plates have been included. Among the latter may be mentioned a series of mantel and fireplace designs, one of which was illustrated in these columns a short time since. The work is accompanied by a price list which cannot fail to be of use to architects when working up designs employing more or less of these special forms. Brick architecture is deservedly popular at the present time, and there are few parts of building construction that are more thoroughly considered or as carefully worked as brickwork at the present time.

W. F. Morris, of Baldwinsville, N. Y., announces that he has succeeded to the business of Heald & Morris, which was the manufacture of centrifugal pumping machinery and steam engines. The business will hereafter be carried on under the name of the Morris Machine Works. We understand that the capacity of the works has been increased. The establishment has an enviable reputation, gained in 20 years' successful operation.

The works of the Paducah Lumber Company, Paducah, Ky., were destroyed some time since by fire and have recently been rebuilt. The new works include a saw-mill and planing mill, both of which have been completely equipped with new machinery. We notice that very large purchases were made from the Egan Company, of Cincinnati. Among the items of machinery furnished by this company may be mentioned a fast-feeding flooring machine, making 100 feet of perfect flooring per minute and working the material on all four sides; a new and improved surfacer, which dresses both sides of lumber 28 inches wide and 12 inches thick; also molding, tenoning, friezing and shaping machines, scroll saws, band saws, resawing machines, self-feeding rip saws and self-feeding cross-cut saws, with a complete set of sash, door and blind machinery. We understand that various leading builders of wood-working machinery in the United States competed for the outfit of this establishment, and that the Egan Company obtained the contract as much on the merits of their machines as the price at which the work was offered. The company, after starting their works, expressed themselves as highly pleased with their equipment.

Those of our readers who are in need of mortar colors will probably serve their interests by corresponding with S. Cabot, No. 70 Kilby street, Boston, Mass. Mr. Cabot is advertising black and red mortar colors of unequaled strength. A descriptive circular is sent to all applicants.

Poulson & Eger, proprietors of the Hecla Architectural Bronze and Iron Works, with office and salesroom at 216 and 218 West Twenty-third street, New York, are directing attention to artistic mantels and over-tops in bronze, brass, oxidized iron and electro-plated iron. This company have facilities for treating iron by the celebrated Bower-Barff process, and their product is of a quality to command the attention of architects and builders generally. In addition to their mantel work, above enumerated, they make ornamental architectural cast and wrought iron work of all kinds.

Those architects, builders and house owners who are interested in heating apparatus, ranges, &c., will appreciate a neat little catalogue which has recently been issued by the Richmond Stove Company, of Norwich, Conn. The book is pocket size, in Russia covers, gilt edges, and contains 100 pages of text, with numerous illustrations. Brief descriptions of the different classes of stoves and heaters are presented, together with a list of prices. The book is embellished by a red line border and red title lines.

Schulze-Berge & Koechl, 75 Pine street, New York, have issued a pamphlet describing "carbolineum avenarius," which is said to be an effective preservative of wood against decay. The pamphlet discusses the general problem of wood preservation, and then dwells upon the merits of the particular material referred to. There is also a list of the places in which wood is used wherein this material is particularly useful. This material and treatment are European in origin, and most of the testimonials which appear in the pamphlet are from firms and institutions in different parts of Continental Europe.

The Scribner Roofing and Cornice Company, St. Paul, Minn., as will be noticed from their card which appears in another column, have recently enlarged their business, and at present, in addition to the lines of work formerly conducted, are engaged in millwrighting and machine work. They have purchased a large plant devoted to architectural ironwork and the general machine business, located near their establishment, and for the future will carry on the several branches of business indicated simultaneously. The addition of architectural ironwork to their line of roofing and cornice specialties gives them an equipment that will be generally appreciated by contractors and builders.

P. W. Ryan, of Marlboro, Mass., is directing the attention of builders in general, and roofers in particular, to his shingling bracket, an illustration of which appears in another column of this issue. The bracket is made of wrought iron, and is fastened in place by two spurs on the lower portion and the clamp which engages with shingles on the upper portion. No nails are used, and when it is once fastened, it is claimed, it cannot slip or tear the shingles. The upper bar of the clamp is fitted with an adjustable gauge, thus adapting it to use on boards of different widths, and securing the board in place when once adjusted.

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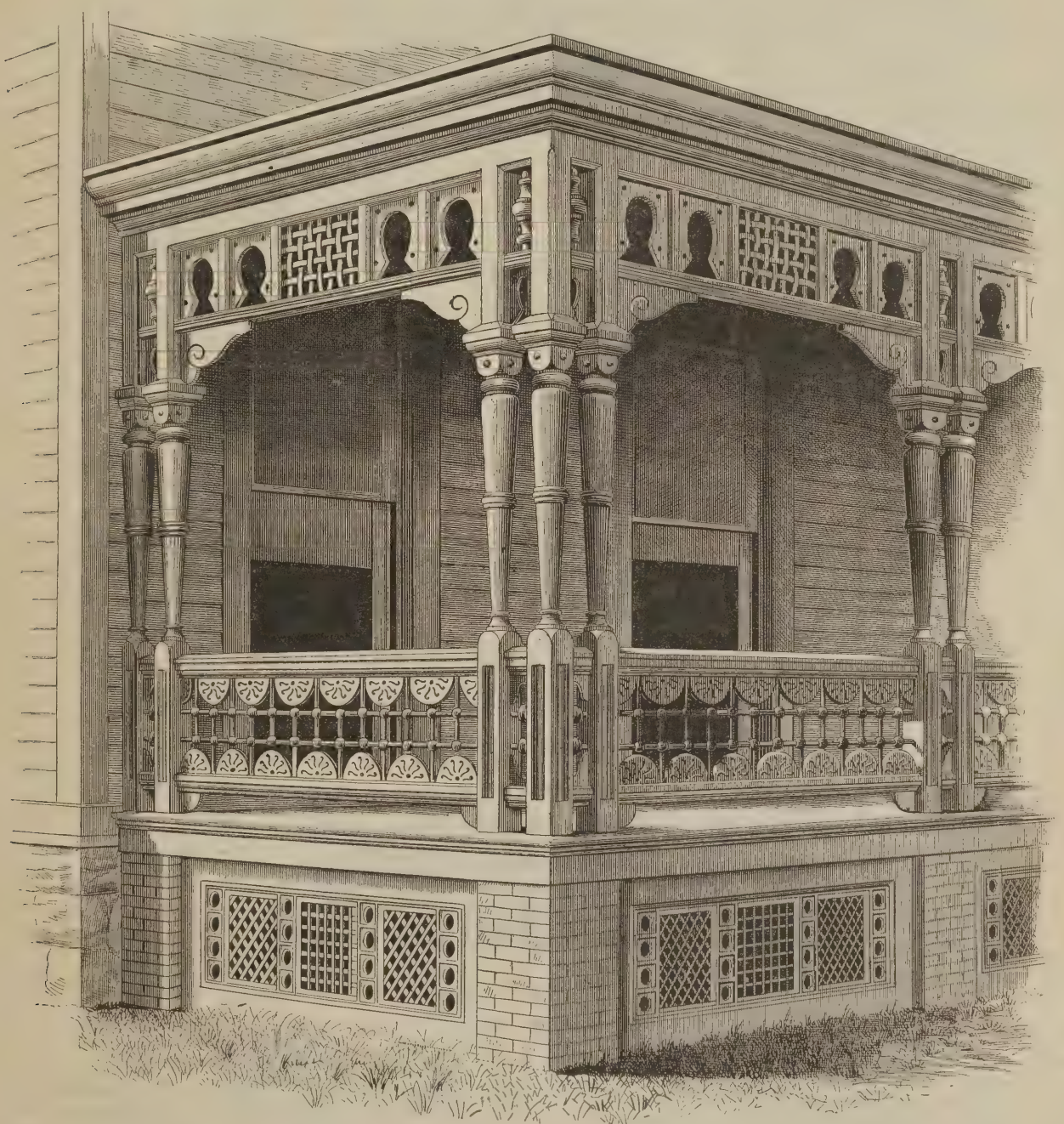
Veranda Design.

We take pleasure in laying before our readers this month another study in veranda work by Mr. J. R. Church, architect, Rochester, N. Y. Our first-page illustration shows, by a perspective view, the general appearance of the finished work. An elevation to the scale of ½ inch to the foot is presented on the second page, while details to a still larger scale are shown on the third page. Mr. Church has given considerable attention to features of construction and ornamentation of work of this character, and he possesses a happy faculty of using his elements to good advantage, thereby producing designs which are neat and effective, and which avoid the common objections to work of this kind of appearing either plain or overloaded. The construction in this instance is so thoroughly shown in the detail drawings that description is rendered unnecessary.



VERANDA DESIGN BY J. R. CHURCH, ARCHITECT, ROCHESTER, N. Y.

The New Orleans World's Exposition buildings, plant and machinery have been sold, the purchase being made in the interest of a new company which has been organized for the purpose of reopening the fair. The price obtained was $175,000.

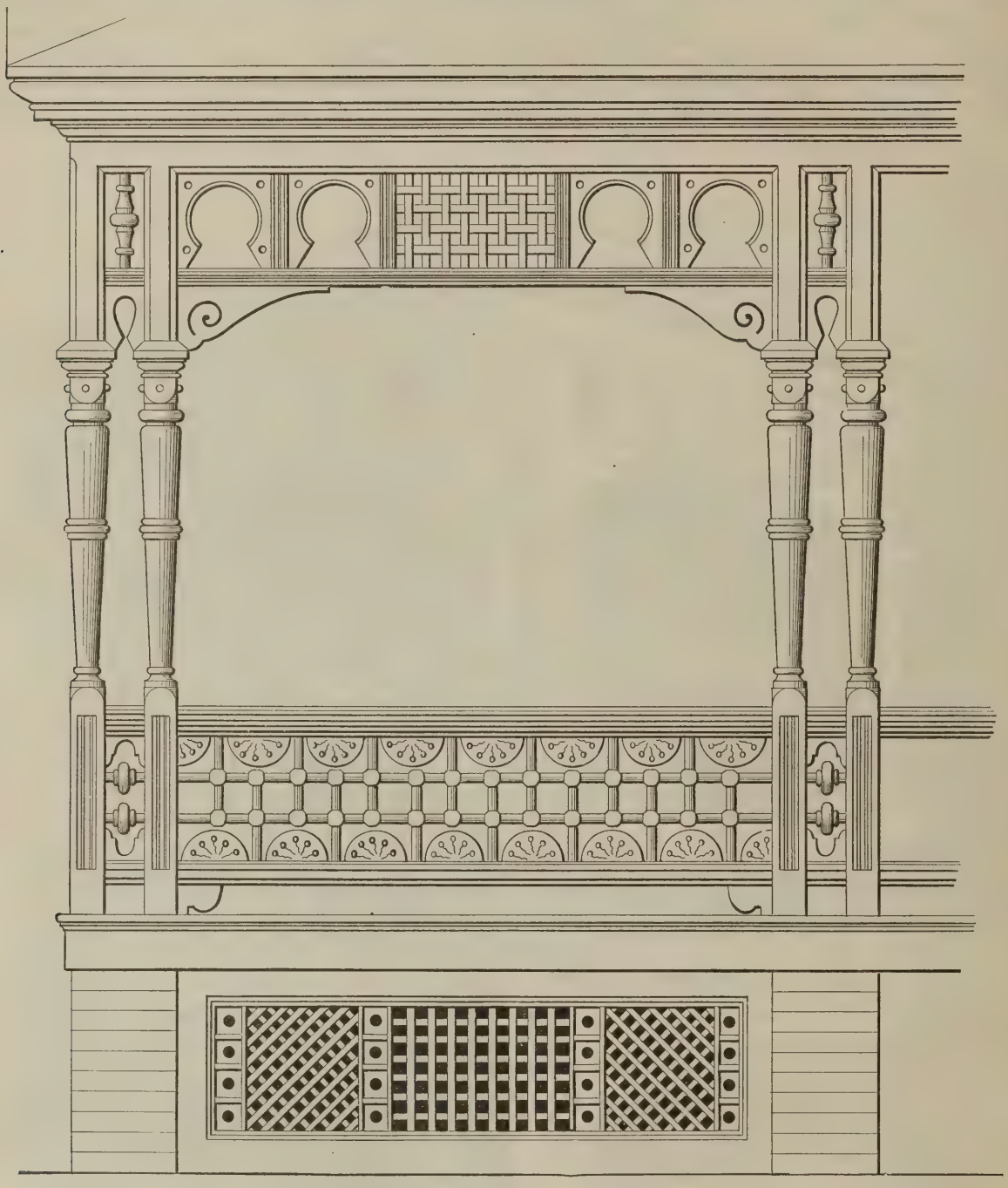
Cast Iron in Buildings.

The following general summary of the use of cast iron in buildings, comparing it with a similar use of wrought iron, appears in a recent issue of the London *Architect*. It will be of interest to our readers in the light of illustrations of cast-iron work and wrought-iron work already presented in our columns :

If any building material can be said to have fallen under a cloud it is cast iron. Unless in the form of columns and stanchions it is seldom used, or only when no other material can be substituted. Cast iron is

supposed to be treacherous, uncertain, incapable of sustaining tensile strains, liable to flaws which are concealed from all eyes, and equally puzzling to operators in the blast furnace and the foundry. How many of its defects arise from imagination may not at first sight be apparent. Constructive science is not without its prejudices, and a good many of them surround cast iron. Why that material should be slighted is easily explained. At the time when exceptionally large railway bridges were projected, a Royal Commission was appointed to inquire into the use of cast iron and wrought iron for the purpose. The risks arising from the vibration of cast iron material. A little inquiry would have shown that Stephenson, who was the chief among them, had no partialities. If he used wrought iron to cross the Menai Straits, in a no less remarkable work, the High-Level Bridge, at Newcastle-on-Tyne, he gave the preference to cast iron. Fairbairn, however, found it more convenient to undertake contracts for wrought-iron girders, and, as he was a rather productive writer, his literary influence was widespread, and was employed in advocacy of the material. Wrought iron was also supposed to offer more facility for designing new types of bridges, and in consequence a great many engineers were attracted by it. During the last 30 years very rolled girders were tried, and eventually the I-girder was evolved. The employment of one with a bearing of 18 feet in a house in the Boulevard des Filles du Calvaire, in Paris, about 1849, was among the most memorable events in the history of modern building construction, and cast-iron beams were henceforth superseded. They had been in use from 1801, when Boulton & Watt arranged the ironwork for Phillips & Lees' mill in Manchester.

There is no denying the convenience and advantages of wrought iron, whether in the form of rolled joists or riveted girders. But let us be just to beams in the other material. When cast iron lost its position little



Veranda Design.—Front Elevation.—Scale, ½ Inch to the Foot.

caused by the constant passing of trains, and from the occasional derailment of a locomotive or a line of carriages, were considered, and it was supposed that cast iron in those contingencies was less suitable than wrought iron. The Britannia Bridge, on the other hand, made it plain that an immense structure could be constructed of plates and angle irons with as much ease as a house was built of bricks, and of a strength that was equal to every reasonable test. The engineers of that bridge—Stephenson, Fairbairn, Hodgkinson and Clark—became, as it were, the law-givers on iron construction, and, as they were supposed to be in favor of wrought iron exclusively, it was made the favored few cast-iron bridges of any importance have been erected in England, while the varieties of those in wrought iron are almost countless.

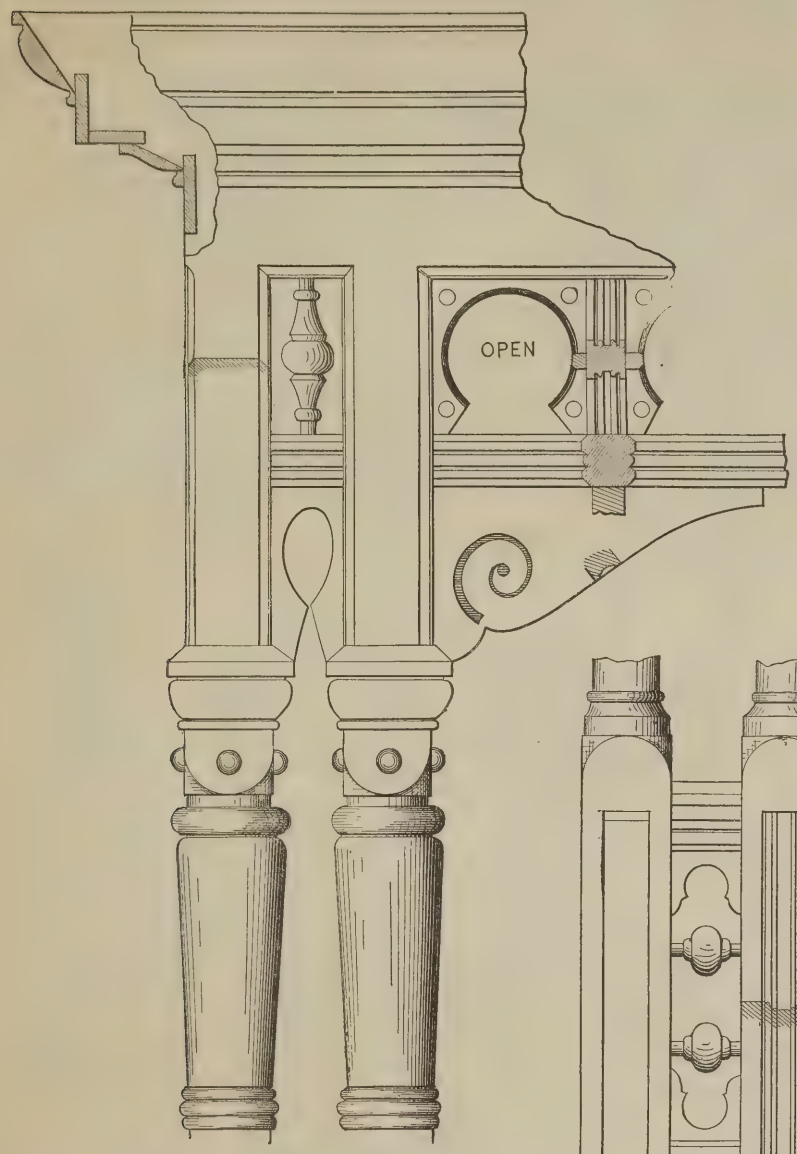
Fairbairn was better known as a practical engineer in connection with mills than with railways, and as soon as, by a piece of sharp practice, he had patented a riveted girder, he was able to introduce a great many of them into buildings. About the same time another influence came into operation against cast iron. In 1846 the carpenters of Paris organized a general strike, and architects and builders were in consequence compelled to substitute iron for wood in floors and roofs. Various sections of was alleged about deficient strength or liability to collapse through invisible flaws. The experiments on it produced remarkable results. Thus, for example, it was ascertained by the Royal Commission on the Application of Iron to Railway Structures that, when cast-iron bars were exposed to successive transverse blows, each blow producing one-third of the ultimate deflection (or deflection immediately before breaking), they bore 4000 such blows without having their strength impaired. It was likewise found that, when bars of cast iron were exposed to successive deflections by means of a revolving cam, they bore 100,000 such deflections without any impairment of strength. These

figures show that cast iron does not so readily succumb even under variable loads which are frequently applied and removed.

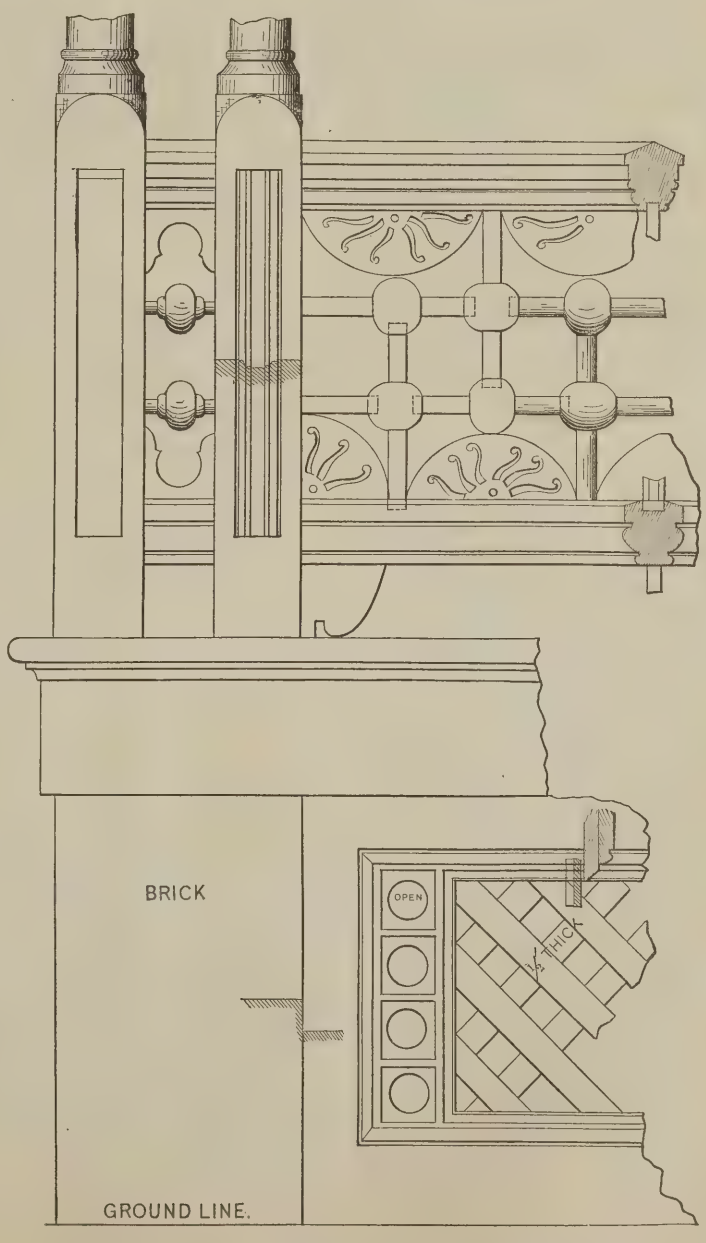
The bridges which were constructed in days when wrought iron was not recognized as a building material are also evidence of the endurance of cast iron. The Coalbrookdale Bridge over the Severn, designed by Abraham Derby, was constructed in 1777. Telford's bridge, near it, at Buildwas, was finished about 20 years afterward, and his Waterloo Bridge at Bettws-y Coed in 1815. The big Sunderland bridge, 236 feet span, dates from 1796, and bids fair to last long, although it is only the work of an amateur engineer. It was designed by the rebellious staymaker, Tom Paine, and was originally put together at the Yorkshire Stingo, in Lisson Grove. Southwark Bridge has sustained the wear and tear of metropolitan traffic from 1819. All these bridges are in positions which are exceptionally trying, and their existence is a refutation of the suspicions which some people have entertained respecting the strength of cast iron. If the material can withstand the variety of loads which pass over Southwark Bridge, and all variations of atmospheric condition, there need be no fear about its security within a building.

With such precedents the corporation of Middlesboro' may have full confidence in the fitness of cast iron to support the floor of their great hall, no matter how crowded it may be. Nevertheless, a good deal of credit is to be given to Mr. Hoskins for the experiment, which has been so well carried out by Messrs. Dennett & Ingle. It would have been possible to have used wrought-iron beams for the purpose, but, apart from questions of expense and headway, the appearance of the room must have been very different. Experience has shown that it is almost impossible to give an architectural character to riveted or rolled girders. The utmost that can be done is to decorate them with painted ornament or to perforate the web plate with patterns. But cast iron is more tractable and lends itself to design. There is, of course, a risk that it can be made into forms which are more applicable to wood or stone, but in good hands there need be no want of fitness in the ornamentation. The material has been so little used that it is not surprising that occasionally there should be a doubt about the artistic treatment that is most appropriate to it. The late Owen Jones did a good deal toward the creation of a style that was adapted to cast iron. He seemed to keep in view the crystalline nature of the material as a fundamental idea, and to have restricted himself to geometrical patterns which would be in keeping with extreme rigidity and power to resist compression. On the other hand, there are structures of cast iron which are so profusely ornamented with imitations of carving as to suggest only the ease with which the metal can be melted and run into molds. The spandrels of railway bridges might be cited as examples which show that more was thought of the flowing curves of the "filling in" than of lines which might express construction.

It is not to be inferred from what we have said that we propose a substitution of cast for wrought iron in buildings. All we venture to imply is that both kinds of girders have their uses, and that, by restricting himself to horizontal beams in wrought iron, the architect very often adds to his difficulties in his endeavors to produce effect, while cases often arise, like the Middlesboro' Town Hall, where cast iron demands a preference before all other materials.



Veranda Design.—Detail of Cornice and Upper Portion of Posts.—Scale, 1 Inch to the Foot.



Detail of Balustrade and Base.—Scale, 1 Inch to the Foot.

Balloon Framing.

There is probably very little difference between the leading features of timber construction as practiced in the States and in Canada. There is perhaps no more difference than would be found upon comparison of the methods followed in different portions of the United States. Hence a description of one plan answers measureably for all. The special form of framing which is very commonly known as balloon framing as practiced in Canada has been considered of sufficient interest to the readers of an English architectural paper to warrant Mr. Thomas C. Sorby, of Montreal, in forwarding to it some excellent sketches. They represent, as he states, Canadian timber construction of a form which is practically independent of skilled labor. It is a rough-and-ready way of nailing sticks together in an efficient and scientific manner in the erection of various kinds of buildings, and, he concludes, is quite commonly employed in cottages, houses and summer hotels. The following is Mr. Sorby's description of the framing shown in the accompanying engraving:

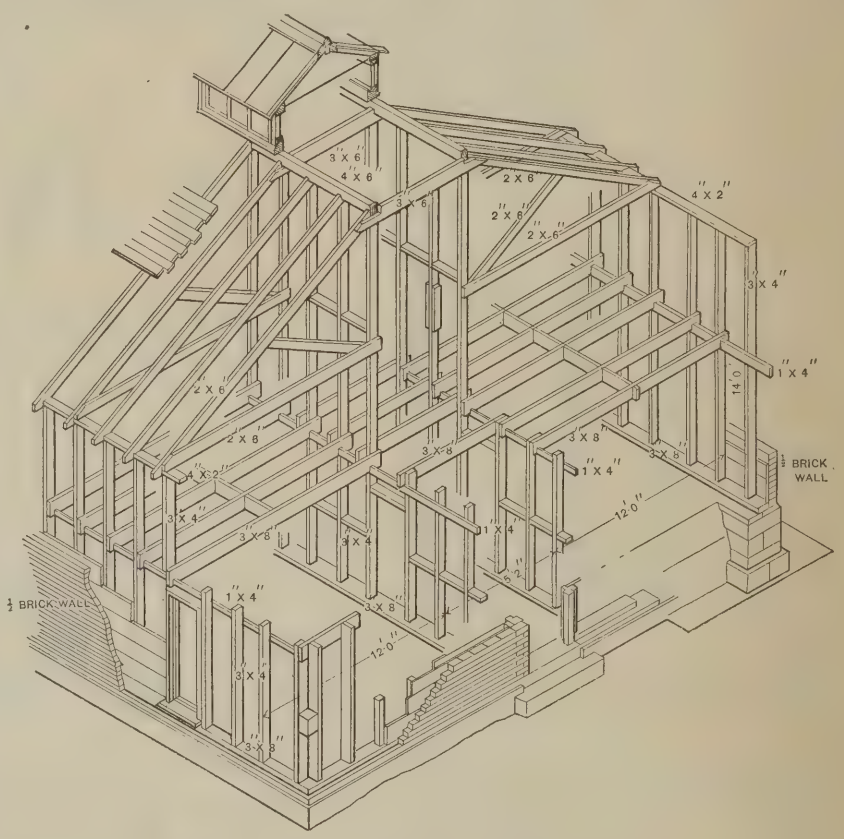
Having settled upon the dimensions of the work, we should proceed to the timber mills and select stuff of the most suitable sizes, 2 and 3 inches by aliquot parts of 12 inches being the readiest scantlings, and 12 to 16 feet the usual lengths, though white-pine timber is easily got up to 20 inches square and 30 feet in length. In the building illustrated the outside studding is 3 by 4 inches mostly 14 foot lengths, the joists 3 by 8 inches in 12 and 6 feet lengths, &c.; thus this part of the labor is dealt with at the mills, the planning of the building being based a good deal on these data, and the timber is brought to the site ready for immediate fixing. Having got in rough foundations and raised them about a foot above the ground, we proceed to lay the sill, usually 6 by 3 inches, hollow and spiked at the angles. I name foundation walls, but roughly-squared tamarac (larch) or cedar logs frequently take the place of stone walls. On the sill the studs are raised and toe-nailed thereto; the angles and door-posts are formed by pairs of studs. In the illustration the angle posts are blocked apart to admit of nailing the end joist to the side studs and for better fixing the internal lining. The intermediate studs are spaced out from 30 to 36 inches from center to center, the window openings causing the variation.

In this case the ground floor was formed with concrete, otherwise the ends of the joists would have rested on the sill close up home to each stud, and have been spiked to sill and stud, forming additional support and perfect tie. The first floor is formed by nailing a 1-inch slab or girt, 4 inches deep, on the face of the studs, at a level of the under side of the joists; upon this the ends of the joists rest, close up home to each stud, and are spiked thereto, the combination forming a perfect cross-tie and a solid bearing. Sometimes these girts are let into a sinking on the face of the stud, forming a shoulder for its support, and sometimes the joints are notched over the girt, offering apparent advantages in support and tie; but, considering the closeness of the joint and its downright bearing, there is little practical advantage to be gained by this great accession of labor, as will be more apparent when the structure is complete. In the illustration the building was spaced for the stock length of 12-foot joists, with half-lengths across the central passage. The joists, where they overlap on either side of the passage studs, are nailed thereto, and notched over the girt, so as to form practically a continuous tie. The joists next the ends of the building are nailed to each stud they pass, every third one being bolted so as to form, when floored over, a perfect longitudinal and transverse tie or diaphragm.

The studs run up the whole hight of the structure, passing between the joists, and if any lengthening is required it is done by placing a piece-butt on the top, and splicing by nailing long 1-inch slabs on each side, as shown. The wall or roof plate is 4 inches by 2 inches, nailed to the top of each stud, the rafters notched over and spiked thereto, one directly over each stud; thus the points of support are always direct. According to the size and use of the building, ceiling joists may be used spiked to plate and after feet, or collars to each rafter, or less frequently, as the case may be. The frame house is then covered externally (and by preference in construction internally also), walls and roofs, with 1-inch or 1¼-inch grooved and tongued boarding in narrow widths. This provides longitudinal tie, and knits the shell into a tight box. The framing and lining together form the essentials of balloon framing, the lining, particularly the internal lining, adding immensely to its strength, more especially if placed diagonally. When the floors are laid, and the lining all on, the building practically becomes a series of solid slabs knit and tied together in all directions, with no weight not directly supported and no thrust not directly counteracted.

Angle-ties, bridging and other stiffening pieces are used in larger buildings for extra strength where the bearings are long or the stories high, but there is nothing in the nature of the construction requiring skilled labor or beyond the capacity of a man and a boy to raise, or needing any other tools than a saw and a hammer. In small buildings all the stuff would be out of 1¼-inch plank, except joists. These studs would be 1¼-inch by 4-inch, rafters 1¼-inch by 5-inch, joists 2 inches by 9 inches, all spaced 30 inches center to center. Outside the boarding the walls and roof are covered with thin asphalted felt, called building paper. The roof in the building illustrated is finished with patent actinolite cement ¾ inch thick, which forms a thoroughly weather-tight roof summer and winter. Varieties of this cement are commonly used here for flat roofs; other roofs are covered with tinned-iron roofing plates, welted or double-seamed at the edges, or pine shingles 14 inches by 6 inches cut feather-edged, and slates, red, green and blue. In town districts these structures, such as that illustrated, are cased externally with half-brick walls, tied in and loaded with long rails or strips of sheet iron, thus presenting the appearance of an ordinary brick house; but in rural districts it is usual to finish the exterior with horizontal or vertical weatherboarding or paneling. The former, which is called "clapboarding," is cut out of the best end of the log, about 7 feet in length; the cuts are made with the circular saw from the outside toward the center, as illustrated, leaving a core or heart of about 3 inches, giving boards from 6 inches to 10 inches wide, about ¾ inch on the outer edge. On knocking this core out the boards fall apart, and are ready for use. Clapboarding is fixed from the top downward, the men working on a bracket scaffold screwed to the studs. Each board is driven up home under the edge of that above it, and a chisel nail driven through the two makes a sound and rapid job. The margin or weather face varies from 4 inches to 6 inches or 7 inches.

In some cases the walls are finished internally with 1¼-inch grooved and tongued lining only, and the space between the studs filled in with sawdust; sometimes they are battened over the boarding, and lathed and lathed and plastered in the usual way, or with wrought lining over the rough boarding. If the inside is lined horizontally or diagonally, the outside may be covered with vertical boarding on horizontal stiffening pieces, or on horizontal or diagonal battens nailed to the studs. Sometimes the upper story is boarded vertically and the lower one horizontally. It is maintained that not only are such buildings some 40 per cent. cheaper to raise than brick and timber used in the usual English plan, but they are (for the climate) more comfortable to live in—warmer in winter and cooler in summer—free from all elements of damp, they can be put up with extreme rapidity to meet a want, and finished off at once, and are ready for immediate occupation. The large hotel at Minnetonka, giving accommodation for some 400 guests, and a great summer resort, was thus built in 100 days. The system prevails throughout the Northwest from the merest cottage to the first-class house and the largest hotel. The elaborate framing of English carpentry, with dovetails, tenons, mortises and pinning, "with oak or iron," expensive straps, heavy timber, close centering, &c., are unknown here, and yet these buildings stand perfectly, and would blow over without falling to pieces. Should a stick decay it can be readily replaced, and, should alterations be contemplated, there is little or no difficulty to be encountered and no expensive preparations are required.



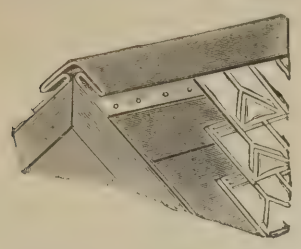
Balloon Framing.—Building at Outremont, Montreal.

James R. James & Co. are erecting at Shreveport, La., a building 80 x 125 feet in plan and two stories in hight. It will be used as a sash and blind factory.

NOVELTIES.

New Metal Roof Trimmings.

Figs. 1 and 2 of the engravings represent Cortright's ridge capping and valley, which the National Sheet Metal Roofing Company,



Novelties.—Fig. 1.—The Cortright Ridging.

of 512 East Twentieth street, New York, are now sending out with their metallic shingles. The valley and ridge are constructed upon essentially the same plan. Our first engraving represents a portion of a roof near the ridge, showing how the ridging would be used, and the second cut shows the application of the same principle to a valley. It will be seen that the metal forming the ridging is so bent as to afford a socket or groove into which the upper course of shingles slips. Two objects are served by this method of construction. A convenient means of holding the upper course of the shingles is provided, and at the same time a neat finish along the ridge is secured. The valley is so shaped that the metallic shingles made by the company will lock over the folds, thus securing absolutely watertight joints. The ridging is made 14 inches wide and the valley 14 or 20 inches, according to the needs of the case.

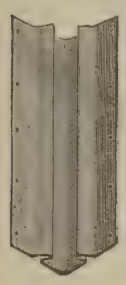


Fig. 2.—The Cortright Valley.

Forrest's Double-Headed Marking Gauge.

Figs. 3 and 4 of the engravings illustrate a new form of carpenter's marking gauges being put upon the market by the St. Paul Novelty Factory, St. Paul, Minn. The tool is the invention of George S. Forrest, of Concord, N. H. It is said to combine four different marking gauges in one handy tool. Two styles are made, one having japanned handles and the other polished brass handles. The body of the gauge forms the handle of the tool, and is provided at each end with a flange or head, as shown in the engraving. The body is grooved inside in such a way that three iron bars slide all the way through it. The larger or center bar may be laid into its place through the open slide or slot

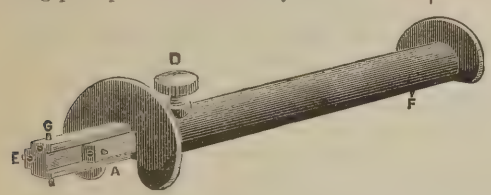


Fig. 3.—Forrest's Double-Headed Marking Gauge.

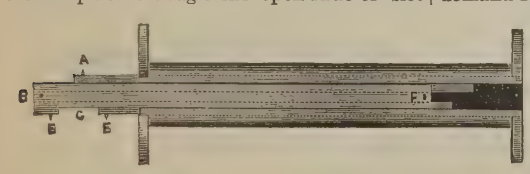


Fig. 4.—Bottom View of Marking Gauge.

in the handle. The other two, which are smaller, are grooved half into the handle and half into the center bar, as clearly illustrated in Fig. 3. The thumb-screw D touches the center bar and thereby tightens or loosens all the bars. The bar A has a marking point, and forms the regular tenon gauge. The points E and E in bars B and C form a mortise gauge. These points are set by placing the bars B and C different distances apart, as well as away from the head of the tool. The marking points F and G projecting from opposite sides of the center bar, one at each end, form a right and left, or inside and outside, gauge, very useful for many purposes. It is specially adapted to marking hinges in hanging doors, and the inventor therefore calls it the "door-hanging gauge." When the point G is set for marking upon the stile of a door the proper width necessary to be channeled or grooved for the reception of a hinge, the point F is thereby set ready for performing a like operation upon the jamb or frame of the door, and *vice versa*. When any extra wide work is to be laid out the bar A may be pulled entirely out and an extra long bar put in its place. This forms what the inventor styles the "panel gauge." The marking points in the several bars are held in place by set-screws screwed flush with the surface of the ends of the bars. The length of the handle is 5½ inches, and the three bars shown in the cut are a little longer than this. The extra bars, not illustrated, are 12 inches long. The bars are polished and the handles or bodies, as already stated, are either brass polished or cast iron japanned.

Foot-Power Circular Saw.

The perfection obtained by steam-power wood-working machinery has developed a demand for efficient tools to be operated by manual power. Steam for some time to come must be confined to permanent workshops, where its advantages make it indispensable. On small buildings in process of construction, however, and in the shop of the job carpenter, manual labor still holds its own. In both interior and exterior finish of houses, stores, &c., there is a considerable amount of detail work which is best done where the work is to be put in place. For this class of work the Narragansett Machine Company, of Providence, R. I., are directing attention to their foot-power circular saw, shown in Figs. 5 and 6. This tool, they claim, will do the work quicker and more accurately than can be done by hand, and with far less expenditure of force. The machine referred to weighs about 200 pounds. It is provided with two balance-wheels which give the saw a steady motion and keep it running for a considerable period after the power of the foot has ceased. The table is 36 inches wide and 30 inches deep, made of cherry wood.

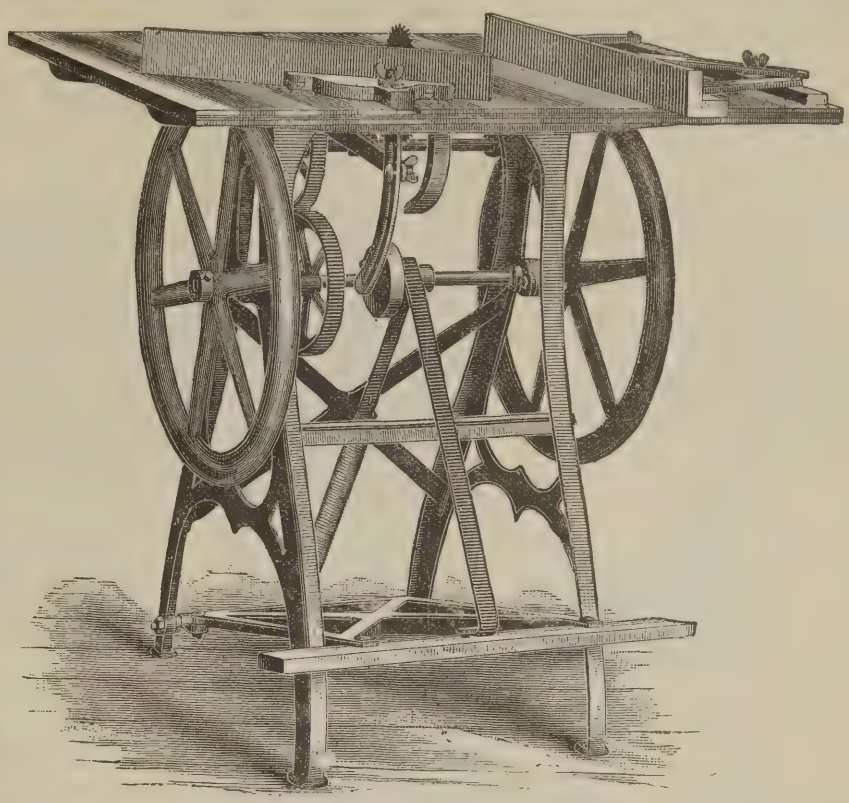


Fig. 5.—General View of Foot-Power Circular Saw, Built by the Narragansett Machine Company, Providence, R. I.

It is provided with all necessary gauges. The treadle operates by means of a clutch connection, so that its motion is in no ways controlled by the motion of the machine. The treadle may be operated irregularly without interfering with the working of the tool. When the foot is lifted from the treadle, the latter is raised by a spring, so as to be in position for the next stroke. The company guarantee these machines, which are simple in construction, to be thoroughly made of material best suited for the work they are intended to perform. A neat circular describing these tools is sent to all applicants.

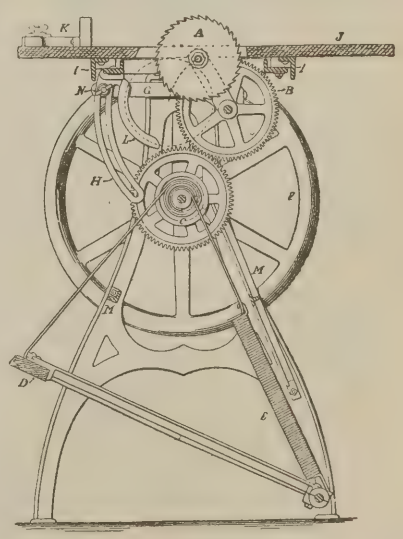
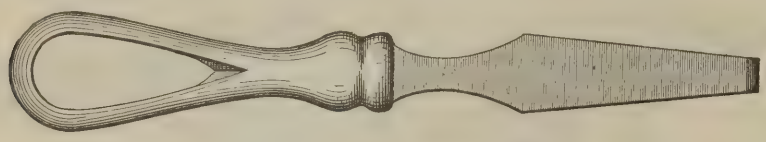


Fig. 6.—Sectional Elevation of Foot-Power Circular Saw.

Screw-Driver.

A screw-driver which is being introduced by Logan & Strobridge, New Brighton, Pa., for whom Samuel A. Haines & Co., 88 Cham-

bers street, New York, are agents, is shown in Fig. 7. As indicated by the cut, the handle is made of iron and cast around the shank of the screw-driver, making what appears to be a very secure fastening. The blade is described as made of the best quality cast steel. The strength and security of this device and the low price



Novelties.—Fig. 7.—New Screw Driver.

at which the screw-driver is offered are the special points which are made in its favor.

The "Excelsior" Chamfer Plane.

A very simple tool designed to make different chamfer cuts is being put upon the market by Mander & Dillin, 2643 Germantown avenue, Philadelphia, Pa. A general view is afforded by Fig. 8 of the illustrations, while the bottom view is shown in

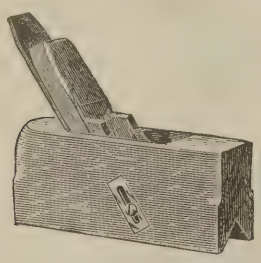


Fig. 8.—Mander & Dillin's Adjustable Chamfer Plane.

Fig. 9. The bottom of the plane is hollowed out in the form of a right-angle notch or groove. A gauge working in front of the bit is adjustable, by which the depth of the chamfer is regulated. This guage moves in slots and is fastened by a set-screw in the form shown in the general view. By introducing different knives and gauges to correspond, molded chamfers and various other forms can be produced by the same tool. In its simplest shape, as shown in the engrav-

Fig. 9.—Bottom View of Plane.

ing, it works a stop chamfer complete, thus dispensing with the use of a chisel drawknife or bull-nose plane. The makers direct attention to the fact that this tool can be adjusted to cut any size chamfer both in length and depth, and that the work can be done in one-tenth the time consumed by the common method.

A Novel Form of Level.

A very ingenious device for measuring vertical angles, the invention of Messrs. James R. Walsh, Thomas F. Murphy and Everett A. Clark, of North Adams, Mass., has been recently announced. Briefly described, the level or inclinometer consists of a cup of mercury and a float, to which is attached a needle that points vertically when the surface of the mercury is horizontal. Referring to the illustrations, Fig. 10 shows the dial face of the level. The longer hand, which travels around the outer circle according to the angle at which the level is held, reads only to within 15°, the angles of the four quadrants being so numbered that the readings give the inclination from the horizontal. The smaller pointer to the right, which operates in unison with the larger one, gives the closer readings, one revolution being made for each 15°. From the divisions of this smaller dial it is seen that the inclinometer will record vertical angles to within $\frac{1}{10}$°, or 6′. Behind the dial plate is a round hole in the wood, as shown in Fig. 13, which is a vertical section of the level through the middle of the block. This cavity contains mercury which fills it not quite half full. Floating on the mercury is a half-disk of wood, the lower edge of which is serrated, as shown in the cut, to allow for the expansion of the mercury though changes of temperature. Through the lower edge of the float, and at a point corresponding to the center of the hole, is a spindle which passes through the face plate and carries the larger hand, shown in Fig. 10. A transverse section of the level, showing the arrangement of the mechanism, is given in Fig. 11, an enlarged view of the same being shown in Fig. 12. Referring to Fig. 12, the two pointers or hands are shown in the upper part of the cut, the large hand being connected directly with the main spindle, as before mentioned. To the right of the cut is seen the smaller dial hand fastened to a second spindle carrying a pinion at its lower end. Engaging with this pinion are two parallel gear-wheels of equal size and the same number of teeth. The number of teeth on the pinion and gears is such that when the latter makes one-twenty-fourth revolution the former makes one complete revolution, or, in other words, when the large hand moves one division on the dial the small hand revolves once. The duplicate gear-wheels are fastened to the main spindle, and above them is a spiral spring, which, by means of a pin, shown at the left, prevents all back lash. This arrangement the inventors attach considerable importance to, as serving to make the working of the device perfectly accurate. The general shape of the inclinometer is like an ordinary carpenter's level, and, when not wanted to measure angles, it can be used advantageously in place of that device for all ordinary work. The inventors state that the inclinometer can be successfully employed in determining the grade of a lot, for planning, for erecting spire and tower rafters, for gutter work and pitched floors, and in numerous other building operations in which accurate work is necessary. An advantage of this level is the quickness with which it acts,

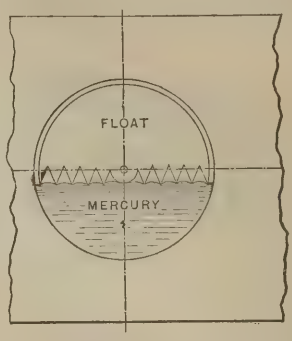


Fig. 13.—Detail of Mercury Float.

the mercury coming to rest in a very short space of time after being agitated.

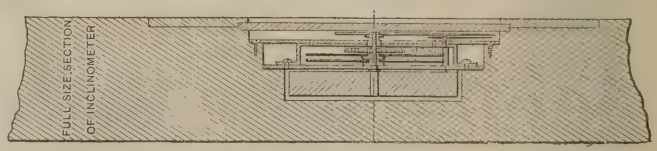


Fig. 11.—Full-Size Section Through Inclinometer.

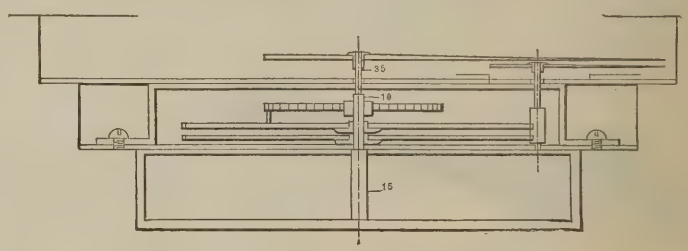


Fig. 12.—Detail of Operating Mechanism.

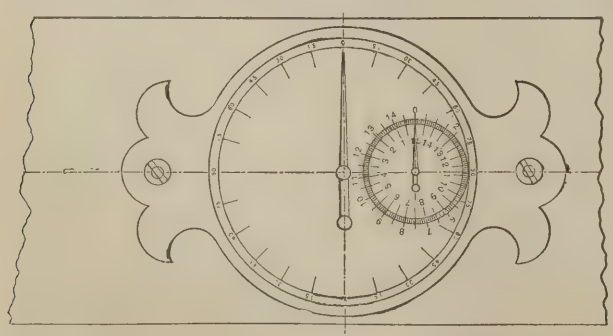


Fig. 10.—Novel Form of Level.—Dial of Inclinometer, Full Size.

The "Windsor" Hand Beader.

Messrs. C. E. Jennings & Co., of No. 96 Chambers street, New York, are putting upon the market the little tool shown in Fig. 14 of the engravings, which is known in the trade as the "Windsor" hand beader. This is an entirely new tool, and is designed to take the place of expensive beading planes and costly machinery, so far as is practicable for beading or molding cabinet-work and house finish. In general shape the tool may in some respects be likened to a draw-knife. The cutting bit, however, is in the form of a disk, two of these being shown in the cut immediately under the tool. In each several different forms are secured, and these are brought to the cutting edge by simply turning on the spindle. At the same time the proper depth of cut with reference to the face of gauge plate is obtained in the same general manner. The manufacturers claim for this tool that it will do a great variety of work, and work that cannot possibly be produced by any other plane or machine. The tool is light, weighing less than ½ pound, and is always ready for use, a special advantage being that it will execute a small piece

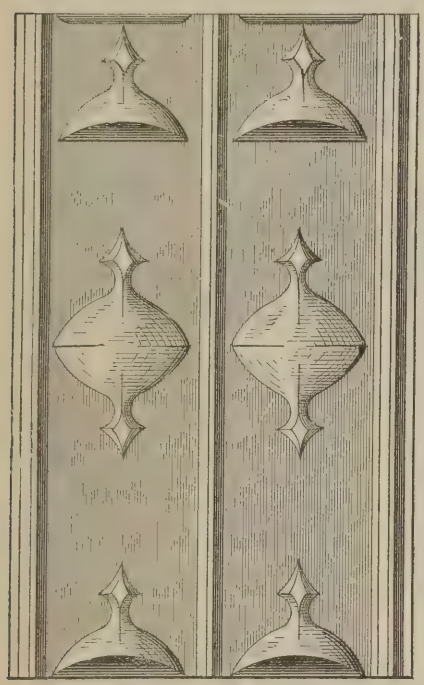
Fig. 14.—The "Windsor" Hand Beader.

of work in less time than a plane of the ordinary kind can be found and adjusted. It will make beadings on curves, angles or irregular surfaces as well as on straight surfaces. It is especially recommended by the makers to all wood-workers that have occasion to bead woods of irregular surfaces. The gauge is stationary, the cutter being adjustable on either side, thus accomodating the grain of wood. The assort-

ment of cutters that is made possible in this tool is practically unlimited, as special bits are supplied at very small cost. The cutters being in the form of flat disks, two of them may be placed in the tool at one time, and so turned with reference to each other as to form a combination bit, thus including a much larger range of patterns than would be possible under other circumstances.

New Metallic Shingles.

The Anglo-American Roofing Company, with office at No. 22 Cliff street, New York, have ready for the market a new form of



Novelties.—Fig. 15.—New Metallic Shingles.—Detached Shingle.

sheet-metal shingle, the general features of which will be understood by an examination of Figs. 15 and 16. This shingle is claimed to have several important advantages over those which have preceded it, both in cost of manufacture, convenience in packing and consequent cheapness of transportation, and also in security against leaks. It is rectangular in shape and the edges lock

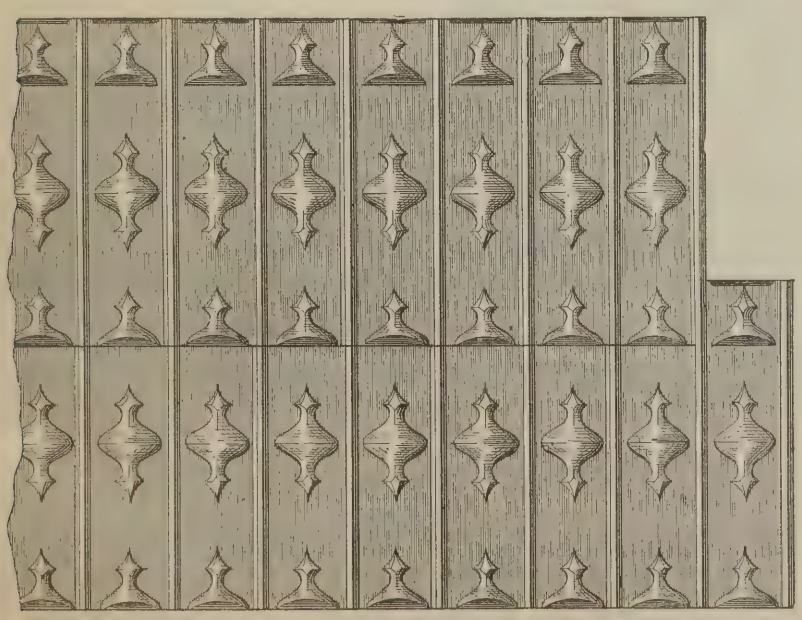


Fig. 16.—Portion of Roof Laid with the Anglo-American Co.'s New Shingle.

together longitudinally by a peculiarly constructed joint. It will be seen that one edge of the plate is bent over upon itself in such a way as to form not only a double rib, but also a locking edge on the inside of the rib. A corresponding hook is turned on the opposite edge, and in laying the shingle it is brought into connection with the locking edge. The result is a very close-fitting seam and three thicknesses of metal in the rib. The lap at the bottom of the shingle is made as shown in the larger engraving. One of the figures which ornament the surface of the shingle is so placed with reference to the ends as to indicate the lap accurately, and also to fit one portion into the other. In addition to this the upper edge of each shingle has an upwardly-turned flange which forms an additional safeguard against the entrance of water. The nailing of the shingles is through the doubled edge, and is clearly shown in the engraving. This secures strength and stability. Holes for this purpose are punched in the shingles in process of making. The lower nail-hole comes close to the overlapping edge of the lower shingle and holds the work very securely. The construction of a roof covering of this kind is of the simplest character, and is such as to be readily comprehended by mechanics of the smallest experience. It would seem that a roof of this sort should be readily laid by any one who can apply common shingles. The side fold in the manufactured shingle raises $\frac{1}{16}$ inch. The entering edge cuts the paint as it is forced into place in such a way as to make the seam almost as tight as though soldered. The shingles are of a shape to nest very closely, and will ship at the lowest rates of freight. The design and construction is such as to admit of the shingles being made out of either tin plate or iron, as preferred.

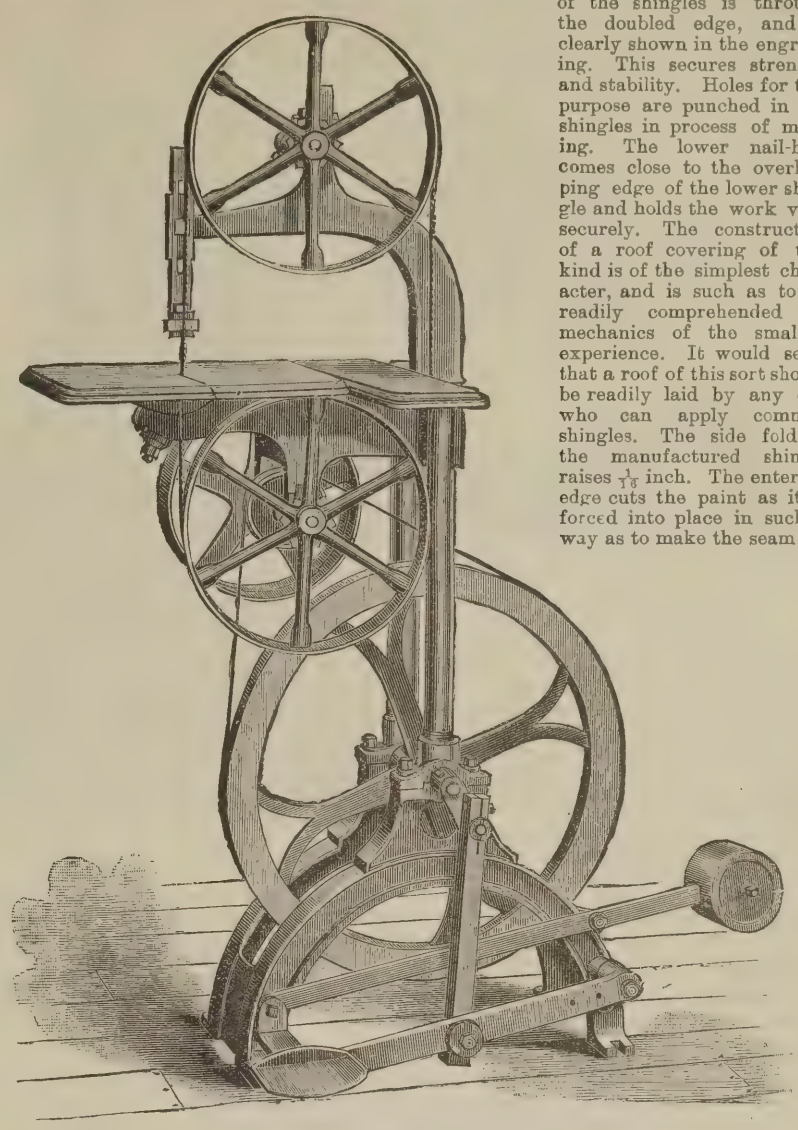


Fig. 17.—Marston's Foot-Power Band-Saw.

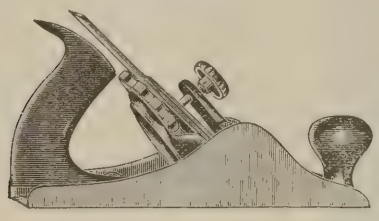
Foot-Power Band-Saw.

J. M. Marston & Co., of No. 3 Appleton street, Boston, Mass., are building the foot-power band-saw illustrated in Fig. 17 of the engravings. The makers inform us that this machine has been designed to meet the wants of that class of wood-workers who need a strong, well-made and substantial machine for actual workshop use that will do heavy as well as light work. The machine is said to be capable of sawing stuff 5 inches thick. It has a clearance of 16 inches between the saw and the frame. The general design of the machine is very clearly indicated by the engraving. The treadle is shown in the foreground at the base of the machine. By it motion is conveyed to the large wheel revolving between the two standards which carry the table, and from this a belt drives a pulley on the lower shaft of the machine. The remaining parts do not differ essentially from the ordinary construction of band-sawing machines. A pulley is provided on the end of the lower shaft, to which a belt may be attached whenever it is desired to run the machine by steam-power. The saw pulleys are leather covered, are 16 inches in diameter, and have a face of $1\frac{1}{4}$ inches. The upper pulley has an adjustment to tighten the saw and also to bring it into line with the lower pulley. The balance or driving pulley is 26 inches in diameter and weighs 70 pounds. The table is 3 feet 6 inches

above the floor, and is made of maple glued up in 1-inch strips The table is 18 x 21 inches in size, and is adjustable for bevel cutting. The makers assure us that the machines are made in the most thorough manner, and that nothing but the best material enters into them. They are claimed to run easily, and it is stated that they will cut much faster than any foot-power jig-saw, and are adapted for all kinds of outside sawing.

Steers' Patent Bench Plane.

Fig. 18 illustrates Steers' patent all-iron bench plane, manufactured by the Brattleboro Tool Company, Brattleboro, Vt. The special feature about this plane is the improved method of adjusting the cutting iron, which does away, it is said, with all lost motion. The adjusting device consists of a disk of cast iron, to the upper side of



Novelties.—Fig. 18.—Steers' Patent Bench Plane.

which a short lever-arm is pivoted eccentrically, the other end of the arm having a short pivot that passes through a hole in the cap. The plane is adjusted by turning the wheel or disk, which, by the eccentric movement referred to, operates the arm and raises or lowers the cutting iron. By turning the thumb-screw, shown in the illustration, the cutting iron is fastened in any position desired. The planes are fitted with regular double irons and are made in five sizes.

Regan's Metallic Shingle.

A form of metallic shingle being introduced to the trade at the present time by the Cincinnati Stamping Company, southeast corner of Pearl and Lawrence streets, Cincinnati, Ohio, is illustrated in Fig. 19. The shingle is rectangular in its general form and has imparted to it in the process of stamping an ornamental figure, as shown in the cut. Its distinguishing feature, comparing it with other shingles, is the side joint by which two adjacent shingles are locked together. By referring to the enlarged section in Fig. 21 of the accompanying engravings, the nature of the joint will be understood. It will be seen that in the process of forming the edge of the shingle is creased and doubled over upon itself, and then afterward made to form a rib with an outside flange which answers for nailing. The adjacent shingle has formed upon its side a rib with a narrow projecting edge which engages in the socket or crease formed in the first. In laying the shingles they are fastened to the sheeting boards by nailing through the flange first described, after which the second shingle is hooked in place, as shown in the engraving. By this means a water-tight joint is made, the nail-heads are covered, and ample provision made for contraction and expansion. The company announce that these shingles are sent out handsomely japanned on both sides in red,

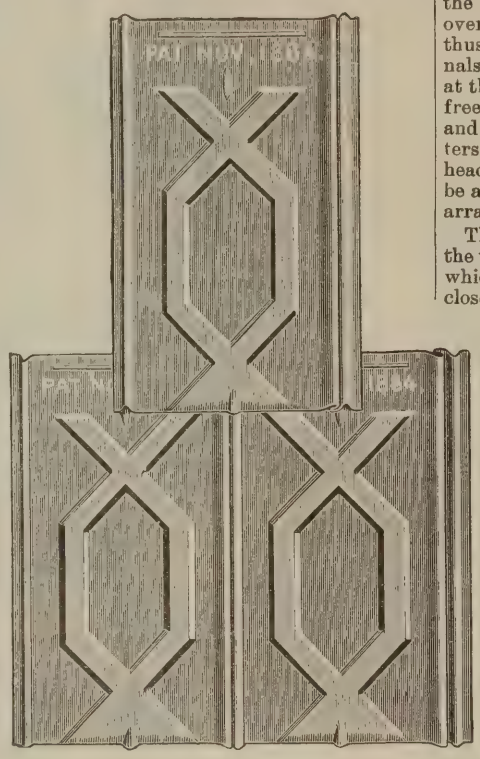


Fig 19.—Regan's Metallic Shingle.

green and blue colors. They are packed one square to the box. Three sizes are manufactured, namely, 7 x 10, 10 x 14 and 14 x 20. The engraving very clearly indicates the provisions that are made for securing proper lap between adjacent longitudinal courses, and also how joints are broken.

Heavy Pattern Flooring Machine.

The S. A. Woods Machine Company, of 91 Liberty street, New York, have recently perfected a new heavy pattern flooring machine, the general features of which are indicated by Fig. 22 of the engravings. This machine has been designed with special reference to high speed and fast feed, and to meet the requirements of mills doing a large amount of business, and at the same time producing the very best work. An entirely new set of patterns has been prepared, embodying novel features, and every part has been proportioned with special reference to convenience and durability. Both top and bottom heads are made from solid wrought iron, slotted and lipped on all four sides, thus admitting of the use of molding, rabbeting or beading cutters. Cast-steel shafts extend entirely through the heads. The journals are large and are fitted with great care. The boxes on top of the cutter-head are united by means of a yoke extending across and under the bed of the machine, instead of over the top, as is usual, thus keeping the journals always in line, and at the same time giving free access for setting and sharpening the cutters. The under cutter-head is also mounted in the frame, and can be adjusted up and down by means of screws arranged for that purpose.

Fig. 20.—Section Through Single Edge.

The pressure-bar on the leading-in side of the top head is attached to swinging arms, which admits of the pressure-bar working close to and directly in front of the cutters, thus preventing the tearing and splintering of the lumber, and is so constructed that it can be set forward or backward to admit of molding or other cutting. The bar upon the opposite side can also be adjusted back and forth for the same purpose. The pressure-bars are also adjustable for the purpose of admitting molding cutters to be used on the under cutter-head. The one on the leading-out side, being weighted, adjusts itself to the required pressure, and both bars are easily removed for the purpose of sharpening and resetting. The bed over the under cutter is easily removed by throwing up the handle, which loosens the binding bolt, leaving the bed free to be swung up on the opposite end. Then, by removing the pressure-bars, the cutters can be readily got at. The head can be turned to present the various sides to the operator by means of the lever handle, which can be inserted in the holes in collar seen at end of box, thereby avoiding the troublesome

Fig. 21.—Section Through Double Edge.

method of turning the heads by the belts. The side spindle frames are attached to and move upon a round bar running across the machine. By this means the operator is

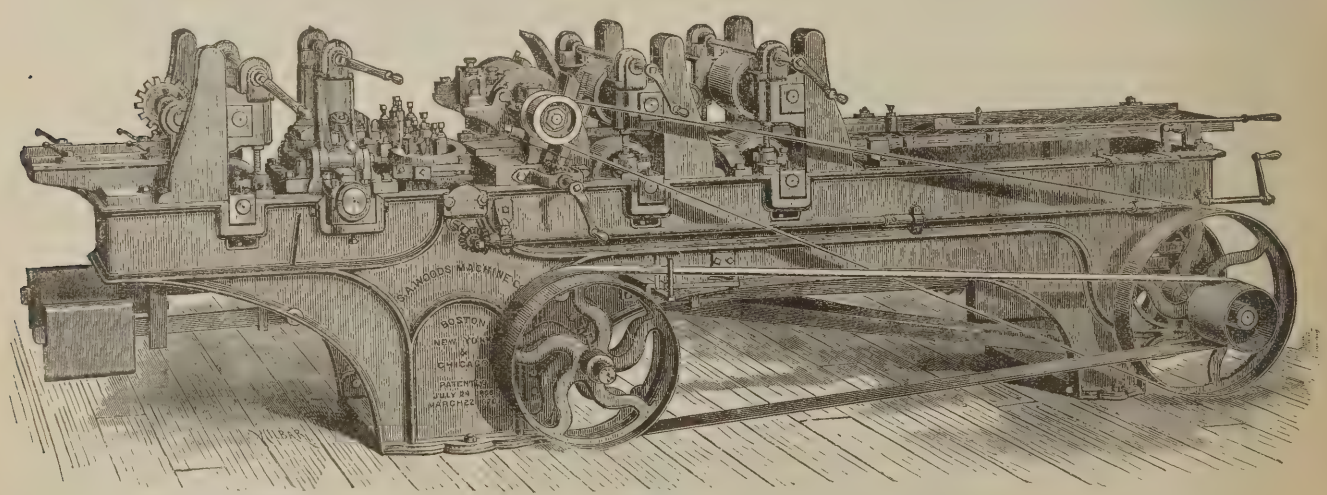


Fig. 22.—Heavy Pattern Flooring Machine, Built by the S. A. Woods Machine Co., New York.

able to adjust and keep the spindles firm in their places at all times. The heads are of cast steel and are provided with the company's patent hinged chip-breaker, which has proved very satisfactory on other machines. One of the side heads can be adjusted at the work end of the machine, a scale being there fixed to show the width required. There are six feed rolls, 8½ inches in diameter, one pair being placed at the end of the frame beyond the under cut-

ters, carrying the lumber entirely through, besides assisting to keep the board in a straight line past side heads and under cutters. All the rolls are heavily weighted, and are provided with expansion gears, and are so mounted with expansion links upon both ends of the shafts that an equal pressure is obtained upon both edges of the board, causing it to always "hug the guide" and feed through straight. The method of suspending and weighting the feed rolls is new, and free from the usual top hamper and expansion gearing upon the work side, which obstructs the operator. The feed works are so arranged that a feed from 25 to 100 feet per minute can be obtained. The frame of the No. 2½ machine, illustrated in our engraving, is 12 feet long and weighs 6500 pounds. This machine, among others, was shown at the New Orleans exhibition.

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HANDY ESTIMATE BLANKS. Compiled and arranged by J. D. Sibley, architect and builder, and A. O. Kittredge, Editor *Carpentry and Building*. Size 9½ x 12 inches, 28 pages, tinted paper. Published by David Williams, New York. Price, single copies, 15 cents; per dozen, $1.50.

THE PRACTICAL ESTIMATOR; being a companion and key to the Handy Estimate Blanks. By J. D. Sibley, architect and builder, and A. O. Kittredge, Editor *Carpentry and Building*. Size 4¾ x 7 inches, 100 pages, bound in cloth. Published by David Williams, New York. Price, $1.

The "Handy Estimate Blanks" have been prepared with an idea of furnishing to contractors and builders a convenient form upon which to make estimates and record the cost of the work which they execute. The blanks are arranged upon a somewhat elaborate plan, so adapted, however, as to make their use equally convenient whether the system indicated is carried to the extreme or some portions omitted. Two general divisions of work are recognized, namely, Masonry and Carpentry. Under each of these heads subdivisions are indicated, which include all the parts of the work required to complete any ordinary structure. For example, under "Masonry" there is listed, among other items, Excavations, Footings, Foundations, Underpinning, Windows, Hatchway or Area, Piers and Partitions, Chimneys, Mantels and Grates, Lathing and Plastering, Drains, &c. Under "Carpentry" there is listed Frame, Frame Covering, Gable Covering, Roof, Cornice, Cellar Hatchway, Windows, Veranda, Fanlights and Transoms, Floors, Closets, Storeroom, Doors, Stairs, Cupola, Outbuildings, Fences, Painting, Tinning, Plumbing, &c. These general divisions are in turn subdivided, and under each are listed the items which go to compose them. For example, in "Carpentry," under the head of "Veranda," the following items appear: Pine Timber, Hemlock Timber, Roof Lumber, Finishing Lumber, Flooring, Roof Covering, Mill Work, Moldings, Iron Work, Tin Work, Nails and Spikes, Labor, &c. Each of the other divisions is similarly subdivided and analyzed. In the column rulings there is a space for "Estimated Quantities," one for "Prices" and then a space for extensions entitled "Estimated Cost." Outside of these rulings there is another set of columns entitled "Actual Quantities," "Actual Price" and "Actual Cost." This arrangement affords a convenient system of comparison between estimated cost and actual cost, not only upon an entire job, but also upon any particular portion of a contract. Further, each of the several subdivisions is so arranged as to be complete in itself. The scheme that the authors have had in mind is that work shall be figured on the basis of actual cost, without any allowance for profit whatsoever, and that the profit shall be allowed either in the way of a percentage or by an arbitrary amount entered in the space provided for the same. The arrangement is such that each individual part of a building may be figured independently of all the others, as to cost and allowance and profits, or all may be taken together and a single entry made for the allowances and profits. Materials are figured independently of the labor required to put them in place, the latter being separately listed in each division. The various subdivisions are numbered, and at the close of the blanks a page is devoted to recapitulation. In it provision is also made for estimated cost and also actual cost, thus facilitating study and comparison.

In addition to the items listed as composing a building, a number of blank spaces are provided, both under the head of "Masonry" and "Carpentry," for listing such items as the special character of a given contract might make necessary, or which the practice of a given neighborhood might require. Further, blank lines are allowed in each of the schedules of the elements of the general divisions. Accordingly, it would seem that there could be no emergency in estimating on any peculiar plan which the individual estimator may desire to follow that these blanks do not provide for. Aside from the general arrangement above described, the blanks provide one or two features worthy of special mention. The 22d page is devoted to a table of Principal Dimensions. Among the items listed are Hight of Stories, General Dimensions, Lengths on Different Lines, and of Different Parts, Hights of Different Parts, Dimensions of Rooms, Dimensions of Doors and Dimensions of Windows. This table is on the outer half of a folded sheet, and is so arranged that the items in it may be filled out as the measurements of the plans progress. By spreading the leaf out to its fullest dimensions, the table is brought alongside of the pages on which work would be done, and therefore is convenient for receiving the items that are to be entered upon it, and also for reference when dimensions can be derived from it, thereby saving remeasurement of the drawings. The general idea upon which it is arranged is that the general dimensions shall be taken once for all from the drawings, thus saving repetition of work. On the back of this folded leaf are arranged a number of tables convenient for use in estimating, prominent among which is a Timber Table. These are of instant reference by merely turning the leaf forward. The first page of the cover of the blank is devoted to a form in which certain data upon which the estimate is based may be conveniently recorded. Among the items may be mentioned, Name of Building, Name of Architect, Name of Owner, and a List of Drawings which were used in the estimate. There is also a space for recording such verbal explanations as influence figures. On the inside cover page space is afforded for a record of the date at which it is understood the work is to be executed, the terms of payment proposed and other important particulars. There is also a form convenient for recording a copy of the proposal which is tendered, based on the estimate, and also a form for recording competitors' figures. In the latter part of the blank a page is devoted to a Schedule of Timber, upon which the material entering into the structure may be analyzed and listed under such heads as Girders, Sills, Posts, Beams, Plates, Studs, Joists, Rafters, &c., for Main Building, for Right Wing, for Left Wing and for Extension. The table is so arranged as to permit the listing of the number of pieces, with lengths and dimensions. Opposite each item there is space for two sizes and for four different lengths. The scheme in this part of the work is that at the time of estimating, or at least when a contract has been received, the work shall be analyzed and a bill of timber made out upon this form. Opposite the page is a duplicate Timber Schedule, which is perforated so that it can be readily detached. The duplicate schedule is intended as an order to the mill or yard for the timber, and also as a list to give to the outside foreman when the timber is delivered, thus indicating the location in the building of each separate piece. The value of this feature of the blanks will be appreciated by all careful builders. The blanks are not so complicated as this description may seem to indicate, but every part has been carefully considered and provision is made for many different things to be used at the discretion of the estimator.

The second book noted above is a companion and key to the "Estimate Blanks." It contains, among other items, full directions for the use of the blanks, with a description of their various features, some of which we have attempted to indicate above. It also contains a chapter on Preparing Builders' Estimates, which is of value to the trade at large, whether they employ these particular blanks or not. It also contains a List of All the Items Ordinarily Entering into a Building, so arranged as to be a convenient and systematic reminder of what is to be listed in making an estimate. This last is arranged in the same general order as the items in the blanks already referred to, but enters far more into detail than the blanks, and, instead of being in the form of an analysis of materials and labor entering into any part of the work, is of the character of a reminder of what the drawings and specifications may possibly show. This list is of the greatest importance to builders generally, and would be serviceable no matter what plan of estimating is followed. The list of items is provided with ample blank spaces in which still further items may be entered in order to make the list complete for any given neighborhood or to agree with any special plan of construction. The book is arranged in such a form, so far as this list is concerned, as to be kept open before the estimator when going through a set of drawings, allowing him, if he desires, to check off the different items, thus keeping track of his work and affording him a convenient means of avoiding omissions or duplications. A considerable portion of the book is devoted to a Selection of Tables, Rules and Formula Useful in Preparing Building Estimates. An Epitome of Mensuration is given, a Table of Multipliers for Facilitating Calculations is presented, and a selection of tables is offered which cannot fail to be of great advantage to all who have estimates to make. The tables of Slating and Tin Roofing are particularly complete. Tables of Wells and Cisterns and Coal Bins, and also the Wages Tables, have been carefully prepared. The general plan of estimating presented in these two books is one which has been sanctioned by the successful practice through a long term of years of Mr Sibley, who is a practical builder of wide experience. The scheme has been somewhat extended and amplified by the Editor of *Carpentry and Building*, both in view of his own experience as an estimator and in the light of suggestions made by many correspondents of this journal on matters of this kind during the several years of its publication. The work has been very carefully prepared in all particulars. While it would be strange indeed if the system shown were faultless, it is confidently offered to contractors and builders as being better adapted to their purpose than anything that has ever before been presented to them.

THE COMPLETE PRACTICAL MACHINIST. By Joshua Rose. Size 5 x 8 inches, 431 pages. Thirteenth Edition. Published by Henry Carey Baird & Co. Price, $2.50.

The present edition has been thoroughly revised and in great part rewritten, and such portions added as were necessary to bring the book up to date and include the latest practice. The popularity of the book is shown by the fact that the present is the thirteenth edition, and in a work of this kind, that necessarily appeals to a limited class, such a large demand is a more than ordinary testimony to the worth of the book. The book is divided into 21 chapters, and deals with lathework, visework, drills and drilling, taps and dies, hardening and tempering, the making and use of tools, tool grinding, marking out work, &c. The concluding chapter is on pumps, and briefly refers to the several kinds in common use. All the subjects are treated fully and clearly, and by aid of the numerous illustrations an exact idea can be gathered of the methods and tools described.

ARCHITECTURAL STUDIES. Part I. Twelve Designs for Low-Cost Houses. Published by William T. Comstock. Price, $1.

This work is quarto in size and consists of 12 plates in a paper cover. The subjects chosen are low-cost houses, and the designs exhibited are selections from competitions which were conducted some time since by the publisher. Brief specifications are given, together with estimates of quantities and prices ruling at the points where the designs originated. A very limited amount of detail work is presented.

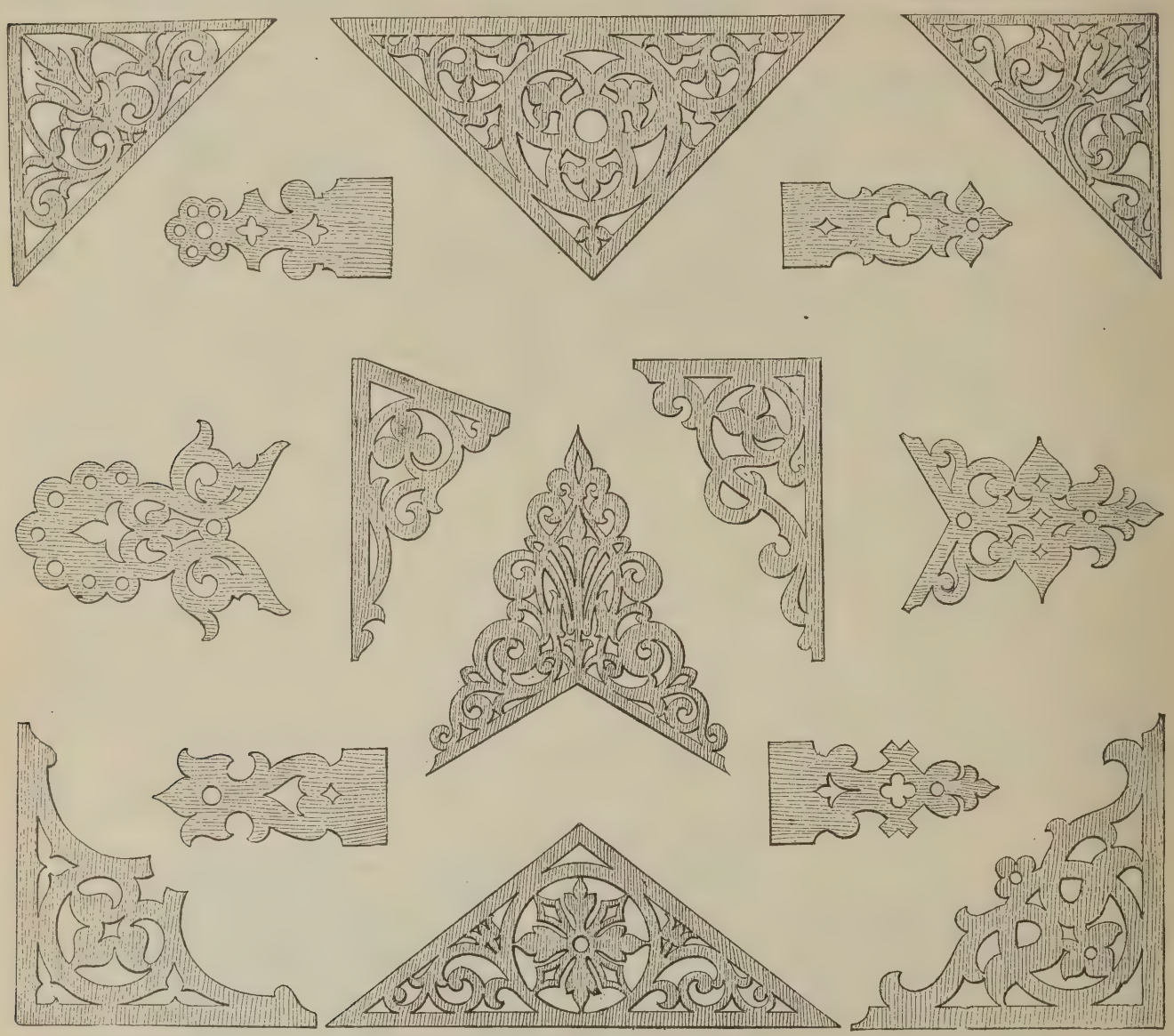
NOTES AND COMMENTS.

The following account of the erection of a concrete bridge in a single day has been published in some of the engineering papers, and will no doubt be of interest to our subscribers: The firm of Zurlinden & Co., of Aarau, having constructed a canal in connection with their works, about ⅔ mile in length, were obliged by the town authorities to bridge it in two places. This they did by means of segmental arches of cement concrete, constructed to the designs of Professor Tetmajer, of Zurich. The dimensions of the arches are: Span, 39 feet 4 inches; rise, 6 feet 6¾ inches; thickness at crown, 1 foot 7¾ inches; thickness at abutment, 3 feet 3½ inches; thickness of abutments, 9 feet 10 inches; width of roadway, 13 feet 1½ inches. The foundation of both abutments is on fairly good gravel, at a depth of about 5 feet below the springing. Spandrel walls are carried up to the level of the roadway, and surmounted by an iron hand-rail, the space between the spandrel walls being filled in with gravel covered with ordinary road metalling. The total weight of the structure between the abutments is 194 tons, or including a live load of 300 kg. per sq. m.—61.5 pound per square foot—211 tons. The first bridge was erected in two days in June, 1884, the two abutments being formed on the first and the arch and spandrel walls on the second day. The bridge was brought into use after standing for about two months, and has been in constant service ever since for heavy-wheeled traffic without any sign of settlement or cracking. On the 9th of October the second bridge was completed between 6 a. m. and 6 p. m. by 65 men. The concrete was mixed in accordance with the recommendation of Professor Tetmajer, as follows: The cement and sand were first mixed dry, then the gravel added, water being gradually added during the mixing in such quantities that when the punning of the concrete was completed a thin film of water showed upon the surface.

Walnut lumber, which a short time since was in great demand for furniture, has to a certain extent lost its prominence in the market. Its scarcity raised the price to such a figure that it could no longer be extensively used for any of the purposes for which it was formerly employed, or, rather, it was no longer a cheap material. At the same time fashion changed also, and mahogany has come again into its old-time prominence. Dealers say that, while there is a falling off in the demand for walnut, the demand for mahogany is increasing daily. Stained cherry is in use, and is a very clever imitation of mahogany for various purposes. Cherry wood, however, in its natural color is very handsome, and, without staining, is at present very popular.

The relative hardness of woods and their power to resist bruises and fractures is a matter of some moment to builders and mechanics in general. Careful tests have been made with reference to native American woods, and a somewhat exhaustive list has been prepared showing their relative hardness. Lignumvitæ stands first among our native woods in power to resist "indentation," which means in the census tests compression in a line perpendicular to the fiber. A punch 1 cm. square was used, and the force required to press this into the wood to a depth of 1.27 mm. was recorded. With lignumvitæ this force was 703 kg. The next 10 species, arranged in order of their power of resistance, belong, as does the first, to semi-tropical Florida, and the first wood on the list, which is commonly known in the Middle States, is the persimmon, ranking No. 32. The hardness of persimmon wood as compared with lignumvitæ, however, is only as 324 to 793.

The art of veneering dates back to the time of Pliny. It was a recent invention in his day, and he descants in his usual antithetical way on the general plan of converting the cheaper into the most valuable woods by plating them with the latter, and also upon the ingenuity displayed in cutting a tree into thin slices and thus obtaining a surface from it far in excess of the usual expensive method of working, thereby obtaining a better price for it. The woods employed for this purpose in his day were the citrus, the terebinth, various kinds of maple, box, palm, holly, ilex, the root of elder, and poplar. The middle part of a tree, he observes, shows the largest and most curling veins, while the rings and spots are chiefly found near the root. The veneers or plates were secured, as at present, with strong glue.



EXAMPLES OF SAWN SCROLL WORK.

One of the characteristics of the metropolis is that its business streets are frequently rebuilt. The houses of one period gave way to the retail stores of the next, and they in turn are supplanted by immense warehouses and wholesale establishments still later. Broadway has been practically rebuilt four times in 40 years. Along almost its entire length from the Battery to Union Square this main thoroughfare has undergone nearly a complete change every decade. The style

of architecture, or rather want of style, must be apparent to every observing person who passes through the street. Each lot owner, it would seem, has been his own architect and has sought to outdo his neighbor, without regard to uniformity or style. The result of this is that with the building and rebuilding no two edifices are of the same design or hight, externally or internally. To say a building is five or six stories high gives very little idea as to the actual number of feet or inches from the sidewalk to the roof. The cornices of the houses differ in style, shape and size, and nothing like uniformity can be seen from Bowling Green to Madison Square.

One of the causes for the great changes in the construction of buildings on Broadway from those popular 40 years ago, and the different styles that have arisen, has been the invention and introduction of the elevator. Prior to the advent of this labor-saving contrivance every person had to walk up and down stairs, and, consequently, low buildings with easy stairways were the most popular. The desire to take from the sky and the bowels of the earth all the space that can be utilized for business purposes led to the construction of lofty edifices with deep cellars and sub-cellars, and elevators enable both extremes to be easily reached. A very tall building is no longer regarded as a wonder. The only surprise seems to be, why have not these things been before. Modest, low-sized, three-story edifices, which in their day were reputed to be of some moment, now look like pigmies beside their more lofty neighbors. The quaintly-shaped chimneys on the corners of the streets, the windows in the side walls of circular, semi-circular and oval shape, the dormers in the gable roofs, the foot-worn stairways and quaint bannister railing, and the low ceilings to the rooms, all speak of a bygone age, and yet those houses are not actually so very old, those who erected them being in many cases still alive and in active business. It is their style that is antiquated. No visitor to the city who has considered the matter of Broadway improvements has failed to feel that some strange destiny held back the few pieces of property which still stand from the onward progress which is observable on every side. Were inquiries to be made with regard to these old-fashioned houses the fact would be disclosed that in many cases the property is held by minors. In others there is only a life estate of the owner, and in still others the title is in a number of persons. While the rents and profits derived from these old-fashioned buildings are good, yet by rebuilding they might be very much augmented.

The æsthetic craze which has been fashionable for a few years past has resulted in many absurdities both in design and decoration. It is not surprising that some of the papers should occasionally attempt a little fun at the expense of those who, with apparent seriousness, consider the eccentricities which are often employed in decorations at the present time as evidences of genius and artistic ability. One or two quotations from a contemporary who very cleverly touches this point will no doubt be appreciated: "In a recent display of fireplaces by a manufacturer, every conceivable design was shown, each having distinctive features of its own. Every demon that was ever seen by a victim of the most diabolical nightmare is reproduced in brass, bronze or wrought iron. Animals that could only exist in the imagination are brought into service, and it will occur to the visitor that to produce such an array of odd and fantastic shapes the artist must have been delirious when he designed them." This is from a description of a new house: "Perhaps the most artistic thing is the vestibule. Mr. ——— has cut a skylight directly over the entrance, and the glass he uses is made of claret bottles split down the middle, from neck to base; then he has taken the bottoms of other claret bottles and stuck them around in the soft mortar as only a born decorator could do, and he has an effect that I have never seen equaled. The door that communicates with the stairway runs up and down with chains on wrought-iron wheels, and looks like an old well-house rather than the doorway in a New York apartment-house. * * * The fireplace in the library is one of Mr. ——'s most successful designs. It is of black wood carved in low relief. There are places at the side for books, shelves for bric-a-brac, and amusing little doors that open into cupboards where wood and coal are kept. * * * I forgot to mention the walls of the library They are papered with the straw material that comes around tea-chests, held on by irregular strips of wood painted by the artist, and here and there a picture inserted as a panel." These extracts are very clever paraphrases of portions of descriptive articles that have been published in the art department of some of the papers. Enough of the "gush" has been omitted to show the naked facts of the case.

From recent experiments it would seem that pressure upon timbers may act as a preservative against decay. In other words, according to one of our contemporaries, timbers subjected to pressure decay less rapidly than those not under pressure. A stick of lancewood bent double and the ends made secure will decompose at the straight ends sooner than at the bent portion. In ancient ruins in Europe timbers supporting heavy roof have been generally found less decayed than those which bore little or no load. In the massive ruins of Duckey Hall, in Lincolnshire, a round carved coping in which the wood had been bent into place when green was found sound when all around it was rotten. Iron, on the other hand, is liable to lose strength when subjected to continuous pressure or strain beyond its elastic limit.

It is commonly supposed that wood is lighter than water, or, in other words, that wood, whatever its kind, will float upon water. A few who have given attention to this subject are aware that there are exceptions to this rule. A recent writer directs attention to the fact that there are 16 species of trees in America whose perfectly dry wood will sink in water. The heaviest of these is the black ironwood (*confalia ferrea*) of Southern Florida, which is more than

EXAMPLES OF SAWN SCROLL WORK.

30 per cent. heavier than water. Of the others the best known are the lignumvitæ (*guaiacum sanctum*) and mangrove (*rhizophora mangle*). Another is a small oak (*quercus grisea*) found in the mountains of Texas, Southern New Mexico and Arizona, and westward to the Colorado desert, at an elevation of 5000 to 10,000 feet. All the species in which the wood is heavier than water belong to semi-tropical Florida or the arid interior Pacific region.

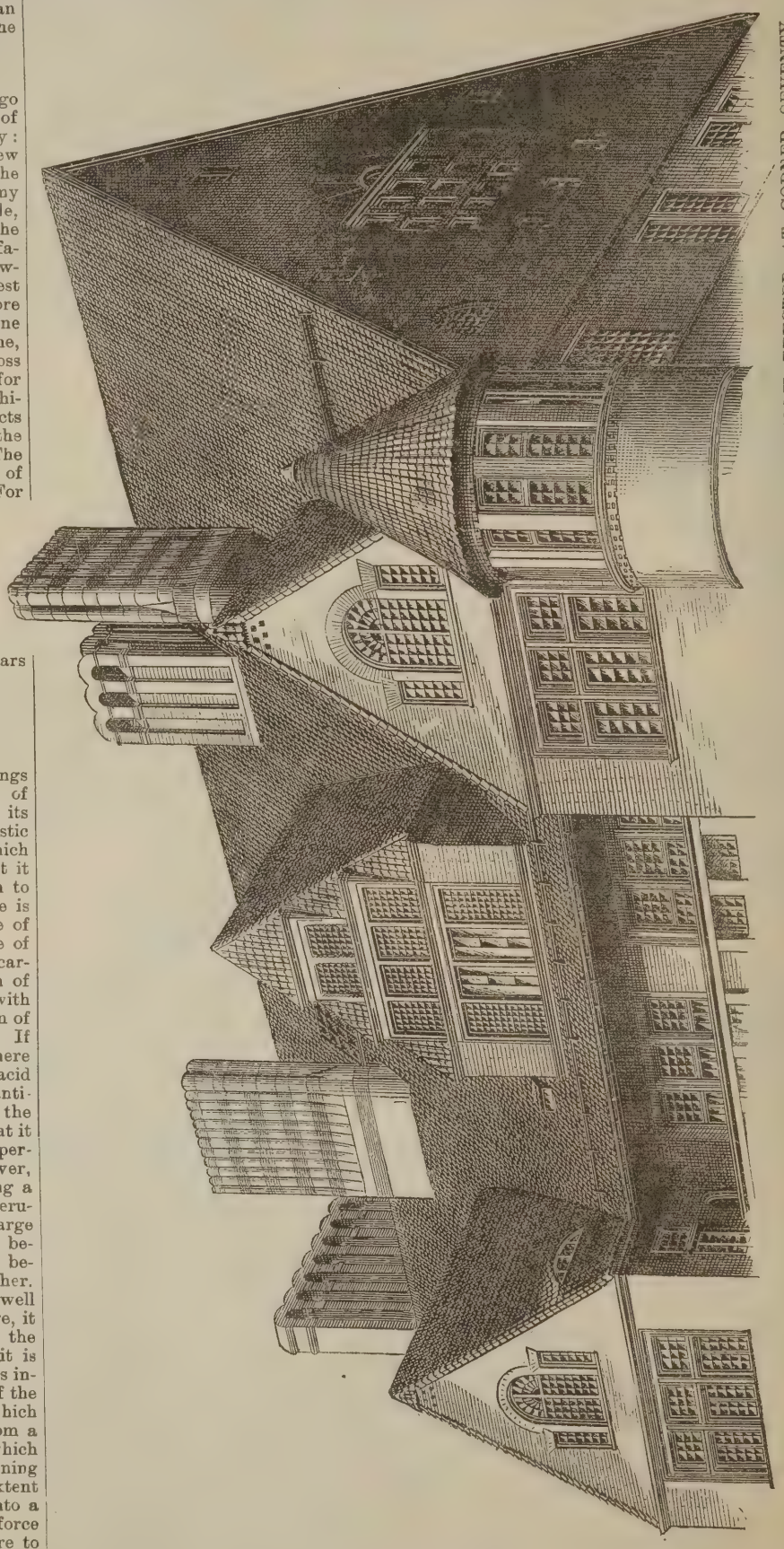
A correspondent writing from Chicago gives the following description of some of the more recently built portions of that city: The architectural appearance of the new business districts is pleasing, although the light-colored sandstone is growing grimy with soft-coal smoke. On the North Side, which was completely swept by the fire, the new residences afford relief after the fatiguing effect of rows of monotonously yellow-front houses in the South Side and West Side. Smooth-faced bricks are used more extensively, with trimmings of brown-stone or terra-cotta. A peculiarly-stained stone, like granite from which patches of moss have been scraped, is effectively utilized for large dwellings standing apart. The architecture is varied, the effort for new effects being strikingly apparent. The width of the streets aids in producing good effects. The new depots are models, and the Board of Trade's new building is impressive. For many years old families were land poor, and the fire caused the transfer of millions of dollars' worth of property mortgaged at high figures; but now the vacant blocks are being gradually absorbed within the boundaries of the business district, and property that could have been bought for a few hundred dollars 10 years ago is now worth as many thousands.

Mortar.

The following extract from the writings of Professor Sullivan upon mortar is of interest to all builders: "Cement in its widest sense means any liquid or plastic substance capable of solidifying, by which bodies may be firmly bound together, but it is perhaps better to restrict the term to those of mineral origin in which the lime is employed in the condition of carbonate of lime or caustic lime. If we burn a piece of limestone or chalk we deprive it of its carbonic acid and reduce it to the condition of caustic lime, which, on being moistened with water, will combine and solidify a portion of it, and become slaked or hydrated lime. If this compound be exposed to the atmosphere it will gradually absorb the carbonic acid which is always present in minute quantities in the atmosphere, and becomes the same substance, chemically speaking, that it was previous to having undergone the operation of burning. Its form will, however, be completely altered. Instead of being a hard, compact mass, it will be quite pulverulent. If, however, it be mixed with a large quantity of sand, and placed as mortar between stones, it will in course of time become quite hard and bind them together. The cause of this cementation is not well understood, but, so far as we can judge, it it is attributable to: 1. The action of the lime upon the sand, by which part of it is converted into silicate of lime, which is insoluble. 2. The crystallization of part of the caustic lime. 3. The peculiar force which causes certain substances to abstract from a solution a portion of the solid matter which it may hold dissolved without combining with it, and which even acts to some extent between one solid and another made into a paste with water. This is the same force which causes dyestuffs, &c., to adhere to tissues. That these forces may produce their full effect the mortar must gradually dry, and hence, in the presence of water, scarcely any binding action could take place. There are some limestones, however, which, when properly burned, will actually become hard even under water. On this account they are called hydraulic limes, from their capability of being employed in hydraulic structures. It is quite evident that the cause of the settling of such limes is to a great extent different from that of common mortar. In this case the cause is apparently altogether chemical, for we find on analyzing these limestones that they do not consist of pure carbonate of lime, but contain a variable proportion of a material consisting chiefly of silicates of alumina, with some potash and soda. When such limestones are burnt the carbonate of lime which they contain is converted into caustic lime; this reacts upon the silica compounds and forms a combination that solidifies in water. The more, therefore, of this clay-like substance which exists in a limestone up to a certain point, the more rapidly and perfectly will the resulting lime solidify under water."

A Modern Tile Roof.

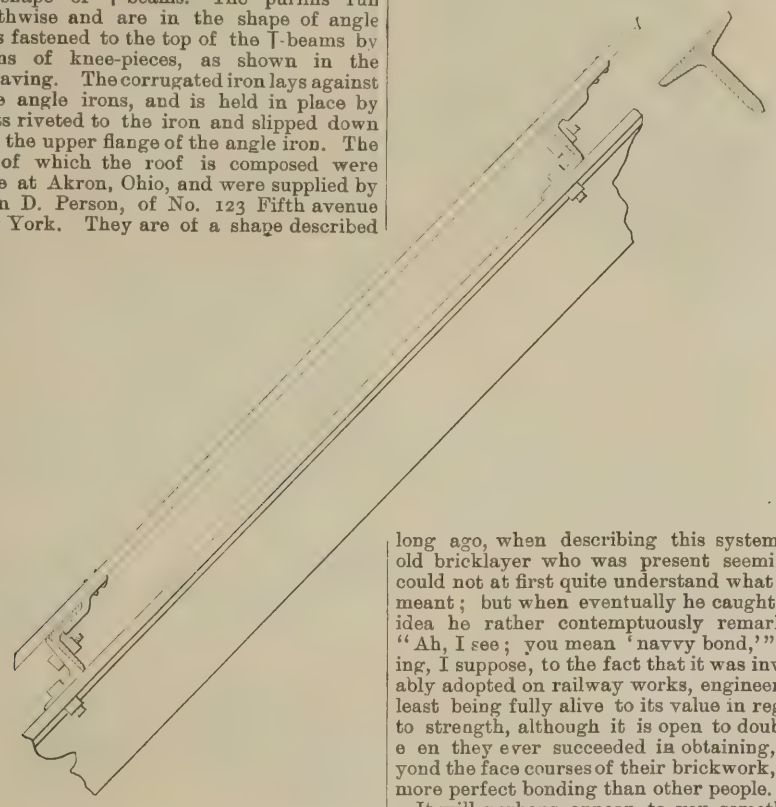
One of the most conspicuous residence buildings erected in New York for some time past is the house of Mr. Charles L. Tiffany, of the well-known firm Tiffany & Co., jewelers in Union Square, situated on the corner of Madison Avenue and Seventy-second street.



PERSPECTIVE VIEW OF THE UPPER PORTION OF THE RESIDENCE OF CHARLES L. TIFFANY, RECENTLY ERECTED AT CORNER SEVENTY-SECOND STREET AND MADISON AVENUE, NEW YORK CITY.

The building is very large and massive. No expense has been spared in construction, and the attempt in some particulars has been made to produce an edifice which should be unique both in materials and design. The brick employed are of a size differing from those ordinarily used, and are also of a different color. Other features are equally peculiar. One of the most strik-

ing characteristics of the building is its roof. This differs materially from the roof of the conventional city residence. A fair idea of the upper portion of the building, both in design and roof finish, is conveyed by the perspective view on the opposite page. The shape shown reminds one of some mediæval building, and the huge gable and formidable array of chimney stacks would cause one to suppose the building to which they belong to be almost anything but a modern city residence. The framework of the roof is of wrought-iron, over which corrugated iron of what may be described as a dovetail pattern, shown full size in one of the accompanying diagrams, was laid, and upon this the tile were placed, being fastened in position by bolts. The principal rafters are in the shape of T-beams. The purlins run lengthwise and are in the shape of angle irons fastened to the top of the T-beams by means of knee-pieces, as shown in the engraving. The corrugated iron lays against these angle irons, and is held in place by cleats riveted to the iron and slipped down over the upper flange of the angle iron. The tile of which the roof is composed were made at Akron, Ohio, and were supplied by Orrin D. Person, of No. 123 Fifth avenue New York. They are of a shape described



A Modern Tile Roof.—Construction of Roof.

as the Spanish pattern. This shape is not new in tile, although we believe the present building is the first that has employed it, at least in so conspicuous a manner, in New York City or vicinity. Where the tile came in contact with wall surfaces, as about chimneys, &c., cement was placed upon the corrugated iron, and the tile firmly bedded in it. In othes instances the tile were simply hung in place by bolts passing through the sheet iron. The corrugated iron above referred to is of ordinary gauge and galvanized. Special patterns of tile were used at the eaves, on the ridges and along the line of the gables. The tile employed are of the character known as glazed, and are nearly black in color, with a silver cast.

One of the most difficult pieces of work, so far as the roofing of this building is concerned, was the covering of the tower, shown on the corner of the building in the foreground. This roof is almost a perfect cone in shape, and each course of tile was of necessity made of a smaller size than the one immediately below it, in order to maintain correct lapping and straight lines. A very large number of special patterns were thus made necessary. The finished work presents a rather handsome appearance, the color of the tile contrasting pleasantly with the body of the brickwork. The building in its lower portions is as much a departure from the conventional type of city residences as the upper parts. A large arch forms the passageway to an interior court, and there is no entrance to the building except through this passageway, which at night is to be closed by a huge iron gate that reminds one of the *portcullis* of some feudal castle. The interior of the building is being fitted up upon a scale of magnificence that scarcely admits of description. The architects of this structure are Messrs. McKim, Mead & White, of New York.

Bricklaying.

I will now describe to you, says a recent writer upon this subject, what is meant by perfect bonding. This becomes possible only by adopting the system known as "old English bond," presumably so called because it originated with the early English bricklayers. But by whatever name it is called it is the one and only method by which brickwork can be made perfect. Not so very long ago, when describing this system, an old bricklayer who was present seemingly could not at first quite understand what was meant; but when eventually he caught the idea he rather contemptuously remarked, "Ah, I see; you mean 'navvy bond,'" owing, I suppose, to the fact that it was invariably adopted on railway works, engineers at least being fully alive to its value in regard to strength, although it is open to doubt if even they ever succeeded in obtaining, beyond the face courses of their brickwork, any more perfect bonding than other people.

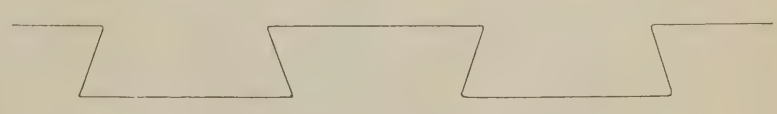
It will perhaps appear to you something like a paradox when I tell you that this apparently mysterious matter, about which you have heard so much, is in reality no mystery at all, as I will show you; or rather, I might say, if there is anything mysterious about it, it is to be found in the fact that there is so seldom any heed taken of it. It simply consists of a method of so placing the bricks, as I stated before, on both faces of a wall, in such a position that each brick or portion of a brick on each face shall correspond with the other, and those in the inner section to conform to those on both faces. Thus it will be plainly seen, if this rule is strictly followed—and there is nothing but the will to hinder it—that in exact proportion as the face bond is technically and practically correct, so will be the perfection of the bond in section. Under these conditions it is immaterial what is the thickness or variations in thickness of the wall or walls; so long as they are made up of whole bricks or halves in the usual way, the bonding is certain to work out correctly in all cases. When it occurs that the thickness of all contains an odd half brick—for instance, a one-and-half, two-and-half bricks, and so on—the odd half must be kept on the face. Thus one side of the wall will be stretching, the other heading, courses, alternately.

This rule, so far as the face is concerned, is generally understood, but it is in such cases where, as regards the bond in section, the greatest irregularity prevails, because the majority of bricklayers insist that the angles or quoins which give the cue to the general face must be set out in all cases alike. Thus it happens in these particular instances nine out of every ten are set out wrongly, and the error committed at the quoin is perpetuated along the whole length of the wall, with this result; the middle consists of so many bricks or half bricks piled up course upon course, one lying immediately on the other, without any bonding whatever other than across the wall.

There is a small, but well known, feature in brickwork which is the subject of a vast amount of controversy among those who are ignorant of the important part it plays in the matter of bonding. This is technically known as the "closer," and it is the key to the whole system. Its place is next the angle header, and its presence gives rise to the systematic lap of one brick over and under another, as seen on the face of all brickwork, and supplies the name "bond." The closer should in all cases be continued throughout the full thickness of the wall on the face of which it occurs in each alternate course. Failing in this, which is more often the case than not, the bond in the quoin is imperfect. There are some who object to these "little bricks," as they sarcastically describe them, and positively forbid their use, with the inevitable consequence of broken and imperfect work, to say nothing of disfigurement on the face. A striking instance I noticed the other day in the case of a rubbed and gauged brick front having at each extremity an 18-inch or two-brick plaster, in which a stretcher is made to fill the place of the usual headers and closers in the same way as in a hollow pier or chimney flue, for which it might easily be mistaken. This, I was told by the workman who built it, was insisted upon by the architect, evidently showing that he sacrificed symmetry and integrity to a distaste for those "little bricks."

This sort of thing, happily of rare occurrence on the exterior face of a building may be seen daily in the case of piers, pilasters or jambs in connection with the interior, where to a certain extent it is to be hidden up. This arises partly from ignorance of the importance of proper bond as an element of strength, and partly from the cupidity of foremen or sub-contractors, as the case may be, who are too apt to leave out of consideration everything possible which, in their idea, has a tendency to impede rapidity of progress, and this even in cases where strength is of vital importance. Picture to yourself a pier or jamb designed to receive the end of a girder carrying a heavy load, and resting upon it, say, a foot or less, and this pier built up with an outer casing of a half brick thick, having no connection by bonding with the inner section.

Bricklayers, as a rule, will plead an excuse for bad bonding that they are not allowed the time to take proper heed of it. But in a certain sense only is that true, because it absorbs the same amount of time and labor to pick up a brick in whatever position it is afterward to be placed, and in many special cases where imperfect bond is the most likely to prevail—for example, filling in the section of a wall or pier—it only amounts to whether a brick shall be placed 2¼ inches to the right hand or the left. Again, in regard to "bats" or broken brick, we know that, so long as we have bricks, so it is certain we shall have more or less a proportion of bats, especially nowadays, on account of the disreputable manner in which they (the bricks) are handled in transit from the kiln to the building, and in these days of competition these bats must and will, in spite of remonstrance, be used. But instead of being bundled into the walls indiscriminately, they should be carefully distributed, and, if placed in proper form in the same position as whole bricks, the bond lengthways of the wall will be the same

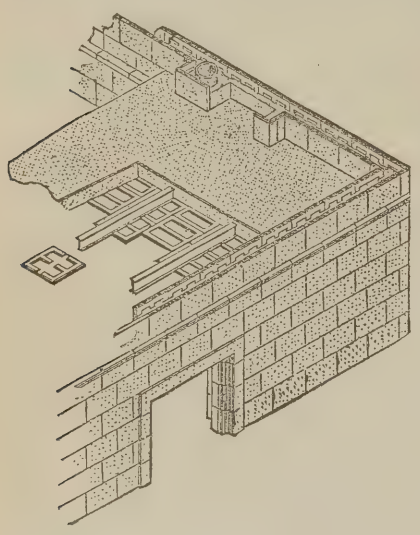


Profile of Sheet Iron to which the Tiles are Fastened.

as if they were whole, and across the wall the defective bonding will be to a certain extent mitigated. It may be urged in reference to this matter, what necessity can there be for any fuss about it? We have got on all these years very well without it; our brick buildings do not, as a rule, fall to pieces. Brick walls are brick walls—what more is needed? I reply, so in the same way a door would be a door even though its stiles were cut in between the rails and the muntins run through. But a man that made such a monstrosity would be unanimously voted an ignoramus. Brickwork is brickwork in the fullest sense of the word only when it is constructed upon those true principles of bonding which I have endeavored, however, imperfectly, to explain to you in this paper; and should I succeed through it in directing the attention of the members of this association toward the subject with that earnestness its importance demands, then I shall have made another step toward the object I for years have had in view.

Concrete Building.

Our subscribers occasionally ask questions concerning concrete building, and we have before now described the general methods in use. Those of our readers who are at all interested in this general question will probably appreciate a brief account of a special plan of doing work of this kind which has been introduced in England. It is known as West's system of concrete building. The general features of the method are readily

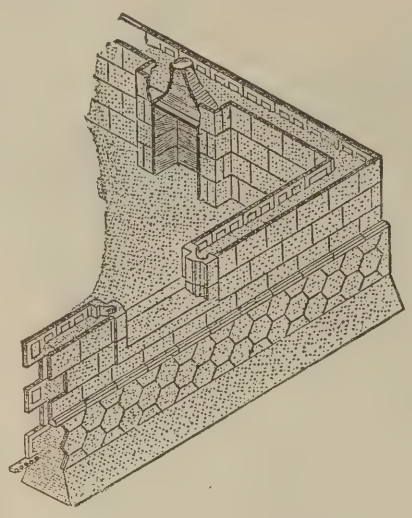


Concrete Building.—General View Showing West's System.

understood by reference to the accompanying engravings. The chief points about the system are that, instead of forming a casing of wood, as ordinarily done, the casing is made of concrete in the form of slabs. The courses of the casing are keyed together by means of a quick-setting cement which is poured into key-holes formed for that purpose in the horizontal edges of the slabs. These key-holes are so arranged that they coincide. The faces of the slabs may have moldings upon them, or may be ornamented in any other way. When the filling behind the slabs has set, they form a finished and ornamental face to the wall. Moldings are applied to the faces of the slabs by inserting them already made into its plastic mass. Heavy moldings are built up in this system as extra courses of the slabs. Figs. 1 and 2 of the engravings show isometric views of work in progress done upon this plan. Fig. 3 shows details of slabs, the use of which will be readily understood by reference to the preceding engravings. The promoters of this system—Messrs. J. & F. P. West, of London—recommend it chiefly on account of its simplicity and because no casings, either of iron or wood, are required; hence no special concrete plant is demanded. They claim that with this system any mechanic of ordinary intelligence could build his own dwelling.

Disintegration of Building Stone.

The sandstone commercially known as freestone, which is extensively used for building purposes in American cities, is subject to disintegration from the action of the sulphurous acid produced by the consumption of coal and from frost. There is much difference in the ability of various quarries



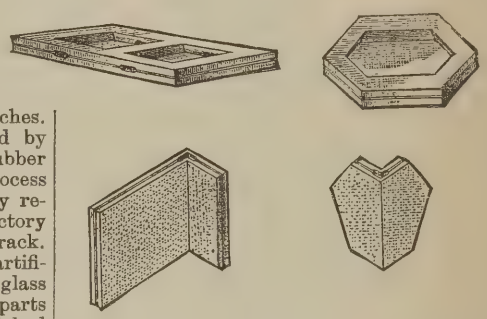
Another Illustration of West's System.

to withstand these destructive influences. The outer surfaces of some buildings in New York and Philadelphia have been, by the advice of an eminent chemist, treated with a mixture of paraffine and carbolic acid, with apparently good results. The flat surfaces are warmed by means of a stove like a plumber's stove, but with a flat side, and the paraffine, when applied in a melted condition, penetrates the stone readily—it is said in some instances to the depth of 1½ inches. Moldings and carved work are heated by means of a blast flame from india-rubber bags of illuminating gas. Another process has been suggested, but the preliminary results do not appear to be of a satisfactory nature on account of its tendency to crack. In this process the mixture used is an artificial stone, and consists of three parts glass sand, three parts broken marble, two parts anhydrous clay, and two parts freshly-slaked lime still warm. After a coat of the above has been applied, wash it with water on the following day. The central portion and wings of the Capitol building at Washington were originally built of freestone, which disintegrated so rapidly as to threaten the permanence of the structure, and the whole was protected by several coats of white paint. The wings afterward added to the above and now used for the House of Representatives and Senate Chamber are built of white marble, which conforms in color to the central portion of the building, so that the whole building appears to be made of marble.

The Use of Coal Cinder in Construction.

M. A. Louvier, an architect of Lyons, France, has sent a communication to the *Société Centrale des Architectes*, giving the result of some experiments upon the use of coal cinders in construction. The idea took its origin in the attempt by the contractors about Lyons to substitute this waste product of coal for beaten earth in their works. As they were not able to solidify it sufficiently by simply ramming, they mixed with it a little slaked lime. This was found to work very well, and arches were tried made of this material; the agglomeration took place rapidly, and this masonry, if it can so be called, presented enough cohesion to allow the uncentering of the arches within one month. At the time the trial was made the cinder was so abundant about the various workshops of Lyons that the cost of this construction was only about 1 franc per cubic meter in place, but soon after, including transportation plant, and labor, it cost about 5 francs for the same volume. At the present time, after 13 years' trial, this method of construction has so expanded in places where economy is required that the cinder of Lyons is about exhausted, and the distance from which the material is brought has raised the price to the neighborhood of 11 francs per cubic meter. In using this coal cinder in the foundation of workshops, warehouses, &c., the usual proportion is 4 parts of the cinder to 1 part of lime. At first an ordinary fat lime was used, but this has been replaced by hydraulic lime. But if a still greater resistance is required the proportion of lime is increased or hydraulic cement is used. In building up a wall the material is applied in beds about 6 inches in depth, and well rammed. The walls are usually about 20 inches thick, but partition walls from 6 to 8 inches thick can be made either by ramming it between plank formers or by making it into the form of hollow bricks or flagging and then putting these together with plaster or cement. Arches in this material are made like those in beton, the only care required being to ram it tangentially and not perpendicular to the extrados of the arch; the latter action causes a tremor in the centering which has a bad effect upon the solidification of the material. The thickness of the arch will be in direct proportion to the weight to be carried; the mean depth is from 14 to 16 inches at the key for a span of 16 feet; the haunches are made at the same time and of the same material as the arches.

This class of masonry, for a long time only used in structures of little importance, has within the last two or three years been adopted by the Lyons architects in works of greater pretentions, and M. Louvier has lately built with it almost the whole of the



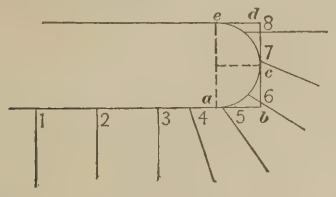
Casings Used in West's System of Concrete Building.

vaulting in the ground floor of the new municipal buildings at Lyons. He had previously made some careful experiments and gives the following as the result: The experimental arch had a span of 20.6 feet and a rise of only 4 feet, and rested upon low stone masonry abutment walls, with its shoulders abutting against the solid earth. The arch had a thickness of 1.47 feet at the key, 2.5 feet horizontal width at the springing line, and 2.95 feet vertical depth over the extreme ends of the springing line. A distributed load of 500 pounds per square foot was placed upon this arch within about 3 weeks after its completion and after 15 days application no fissure or injury of any kind was apparent. The load was then removed and a block of stone weighing 1220 pounds was allowed to fall upon the crown from a height of 3.3 feet without the shock producing any disintegration in the arch. Fears having been advanced that fire would have an injurious effect upon this semi-combustible material, an iron plate was placed under the key of the arch and under this a forge, by means of which the plate was kept at a white heat for half an hour; the cinder masonry showed no signs of being calcined beyond a very thin skin and the resistance to the load remained the same. In the destruction by fire of a theater at Lyons all the work in which the cinder-masonry had been used remained intact, and it was used again in the reconstruction of the building. The relative lightness of this masonry is also an advantage, as it weighs only about 77 pounds per cubic foot.

CORRESPONDENCE.

Questions in Stairbuilding.

From S. B., *New Brunswick, N. J.*—I write to ask for further information concerning some of the articles on practical stairbuilding that appeared in *Carpentry and Building* some three or four years since. The reason that I write so long after their publication is that at the time they were issued I was not a reader of the paper, and so did not see them when first published, a matter which I regret very much. During the past year I saw a copy of *Carpentry and Building*, and was so well pleased with it that I at once procured all the back numbers, including No. 1, January, 1879. I now receive it regularly, and find it a very welcome and very profitable visitor. Were I to suggest any change, it would be to have its calls more frequent than once a month.



Questions in Stairbuilding.—Fig. 1.—Plan Corresponding to Elevation in Fig. 2.

Perhaps my letter may be considered too long, and the reply to it may cause you too much trouble, or the whole may occupy too much space in your columns to warrant insertion at all. If this be the decision I shall not complain, but, on the other hand, I believe that a full reply to it will be of great practical benefit not only to myself, but also to many others. The desired information is as follows:

1. Referring to Article XII, published on page 152 of the August number for 1881, on the subject of hand-rail, a portion of which is raked and another portion level, and which extends over a curve of less than a quarter-circle, I desire to ask, can a center point be obtained in this pattern (as at *f* in the other problems) as a guide in bending the rod. If so, how is it obtained? I find that, with only the two ends of the pattern as guides, the

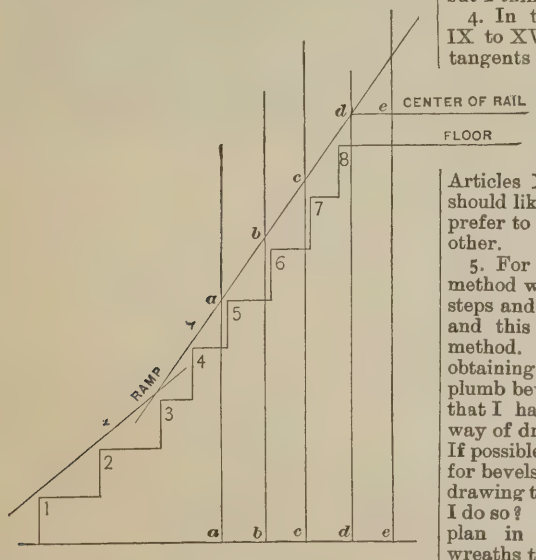


Fig. 2.—Piece at b c is of a Continuous Pitch Over a Quarter-Circle. Piece at c d e is One of a Rake and Level Over a Quarter-Circle.

the curved lines will vary much, from a flat to a sharper curve. This is particularly noticeable in large patterns.

2. In all of the problems, how can a "sliding line" be obtained on which to slide the face mold to obtain correct lines to which the piece is to be shaped? As a slide line cannot be placed anywhere on the pattern, but must be parallel to the major axis, or at right angles to the minor axis, of the elliptical curve, it follows that it is necessary to get one of the axes in order to place the slide line. It is a very useful line, and, I think, should be given. Monckton's "National Stairbuilder" gives it in connection with his method. How can it be produced

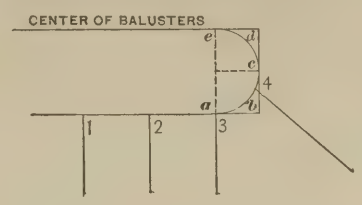


Fig. 3.—Plan Corresponding to Elevation in Fig. 4.

by the method described in *Carpentry and Building?*

3. An article on the application of the face mold to the sawed block to obtain the correct lines to which the wreath should be shaped would have been very useful, and would, I think, have rendered the series of articles more complete. I think such a chapter should yet be given. Monckton's "National Stairbuilder," Plates No. 9 and No. A, gives this in connection with his system,

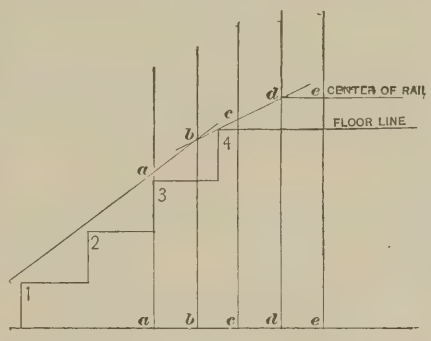


Fig. 4.—Piece a b c Involves Different Pitches Over a Quarter-Circle. Piece c d e is One of a Rake and Level Over a Quarter-Circle.

and is in my estimation a very excellent feature. I do not insist upon an answer to this question, for I can get along without it, but I think I could do much better with it.

4. In the problems contained in Articles IX to XVIII, how were the pitches of the tangents obtained (without regard to the plans in the latter articles)? Or, in other words, can the elevation be drawn, or the inclination of the tangents be determined, in some way other than as done in Articles XXI, XXII and XXIII? If so, I should like to know it, as sometimes I would prefer to use one way and at other times the other.

5. For a long time I have been using a method where the elevation is drawn as the steps and risers occur in the plan tangents, and this has proved a very satisfactory method. I prefer, however, your method of obtaining the angle of tangents and the plumb bevels, as one of the simplest and best that I have yet seen. I also prefer your way of drawing the pattern for the wreath. If possible I would like to see your method for bevels in connection with my method of drawing the elevations. Can I do so? I have pursued this plan in a few cases with wreaths that covered a quarter-circle, the plan tangents being square, and with those that passed over less than a quarter-circle, the plan tangents forming an obtuse angle. I have had no trouble in such instances. I have not yet met any work in which the wreaths cover more than a quarter-circle, the plan tangents forming an acute angle. In such a case, could I draw the elevation as above mentioned? Could the elevation be drawn in this way where the wreath is required to ease up to a newal cap? I send some sketches, Figs. 1 to 8 inclusive, showing this method of drawing elevations.

6. I next desire to refer to Article XVI, published in the December number for 1881, on page 228. The problem is, Two pitches over a quarter-circle. The plan shown has the steeper pitch below, while a plan which I inclose, Fig. 9, has the steeper pitch above. How should the level line be obtained in my plan? I cannot make the line O *o* equal B *b*, as shown in the example. This question will also apply to problems in which more than a quarter-circle and less than a quarter-circle occur, having tangents of different

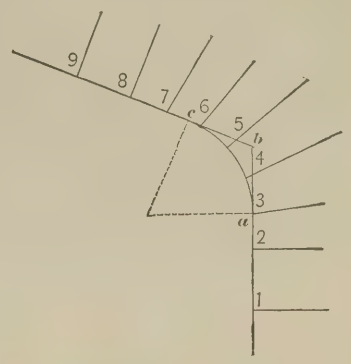


Fig. 5.—Plan Corresponding to Elevation in Fig. 6.

pitches, the steeper of which is above. In all the drawings given in the series of articles referred to, the steeper pitches are below. The level line, as shown by your method, seems to me to be much different from that shown in Monckton's "National Stairbuilder," Plate 5. Why is there this difference, and which is correct?

7. In the different articles where you say make the pattern at the joints somewhat wider than the width of the rail, does that mean the flat width of rail, or does it mean somewhat wider than the diagonal of the rail?

8. I send you a plan (Fig. 12) of a quarter-circle with winders in it where the wreath must rise to a cap. I do not approve of a cylinder of this kind, and have never seen anything of the sort mentioned in any of the works on stairbuilding that I have examined, but I once had a case like it, and had to get over the difficulty the best way I could. What I want to know is, how would a case of this kind be treated by the general

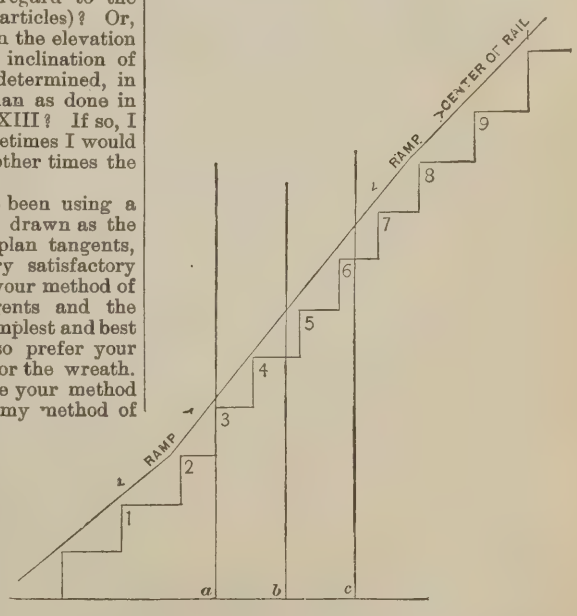


Fig. 6.—Elevation in which Two Ramps are Employed.

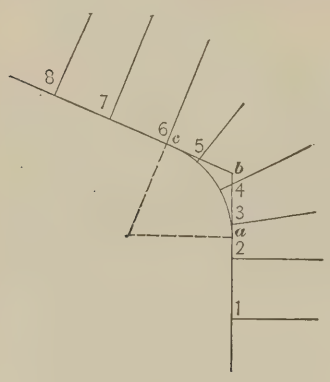
method explained in the series of articles referred to?

9. In Article XXI, occurring in the August number for 1882, on page 144, the turn-out at the bottom of the plan seems to be the problem of a rake and level over more than a quarter-circle. (See also Article X, June number for 1881, page 109.) It seems to me to be all right, only there appears to be a

great difference between these two examples in the manner of getting the center point *f* for the pattern. Please explain this difference and say which is correct, as I do not think that both can be right. In this problem I do not fully understand the manner of drawing the elevation and fixing the pitch of the raked tangent.

10 *a*. In cases of this kind must both of the tangents in plan be at right angles to the radius and of equal length? They are not so in the turn-out shown in Article XX, published in the June number for 1882, page 106. Then why must they be so in the other? *b*. Must the plan tangents in all other cases (as rake and level, common and different pitch over quarter-circles, and also over more than quarter-circles and less than quarter-circles) be at right angles to the radius and of equal length? *c*. The only fault I have to find with the turn-out shown in Article XX is that it does not seem to me that a long baluster will stand at B. That point is too far away from the line of the center of the rail.

11. In the latter articles published, in



Questions in Stairbuilding.—Fig. 7.—*Plan Corresponding to Elevation in Fig.* 8.

which you show a practical application of the problems to different plans, you show only wreathes that pass over quarter-circles, and none that cover more than quarter-circles or less than quarter-circles. Accordingly, you leave your readers ignorant as to how to proceed in these cases Can you not, even at this late day, give some instruction with regard to these problems, showing the manner of drawing the elevation, &c. In Figs. 10 and 11 I send you a plan of a wreath over more than a quarter-circle, and an elevation which I have drawn in the general manner already spoken to. Would this do in cases of this kind?

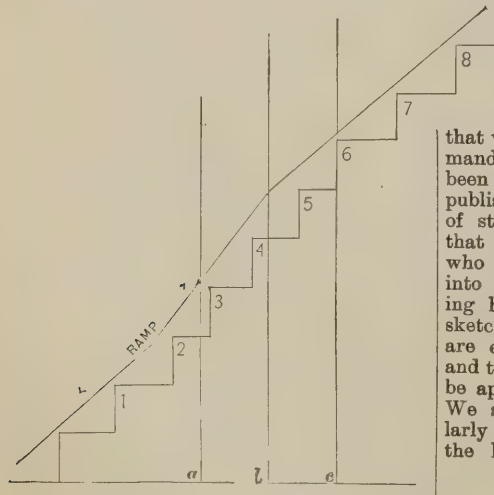


Fig. 8.—*Elevation in which a Wreath of Two Pitches and a Single Ramp is Employed.*

I do not claim that the drawings I send you are works of art; in fact, they are very poorly done, but I hope they will serve to illustrate what I mean. As mentioned at the outset, it is rather late at which to write concerning articles published so long ago; further, I have troubled you with a very long letter, but answers to my questions will nevertheless confer a great favor. The articles referred to have been of great benefit to me, and answers to these questions will in

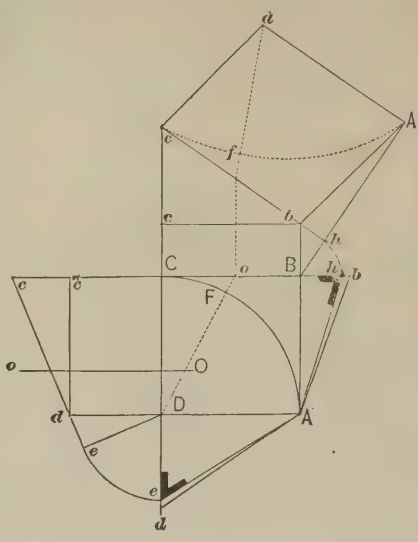


Fig. 9.—*Two Pitches Over a Quarter-Circle, the Steeper Pitch Being Above.*

a measure complete the fund of information desired. I am sure the answers, if published, will be of benefit to others as well as myself.

Answer.—We must admit that the series

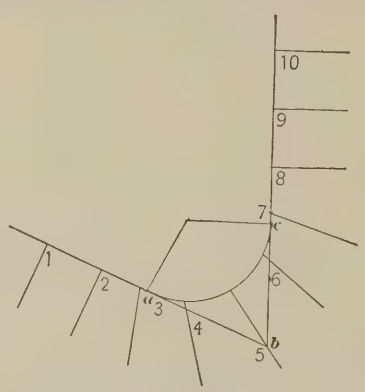


Fig. 10.—*Plan of Wreath Over More Than a Quarter-Circle.*

of questions proposed by this correspondent is somewhat extensive, and that the labor of preparing an adequate reply constitutes a task of considerable magnitude. While his letter and our answer will occupy more space than is ordinarily allotted to a single topic in *Carpentry and Building*, we feel that the importance of the questions proposed, and the character of the information that we can give, fully warrant what is demanded. Our correspondent evidently has been a very careful reader of what we have published in the past on the general subject of stairbuilding. His drawings show also that he is a careful stairbuilder, and one who conscientiously inquires into the principles governing his work. Some of the sketches which he has sent are excellent in character, and their merits no doubt will be apparent to our readers. We should perhaps particularly compliment him upon the last example to which he refers, and which is shown in Figs. 10 and 11 of our engravings. We do not allude to the method so much as the circumstances of the case, which make his way about as correct a guide for the hight of balusters as could be obtained by any other plan. Referring more specifically to our correspondent's questions, we will attempt to answer the most of them, arranging our replies in the same order as we have numbered his inquiries above.

1. In the case of a long pattern it is desired to find a center point in the elevated curve line to serve as a guide in bending the rod. Take the point F, Fig. 15, which we have introduced to better illustrate our reply,

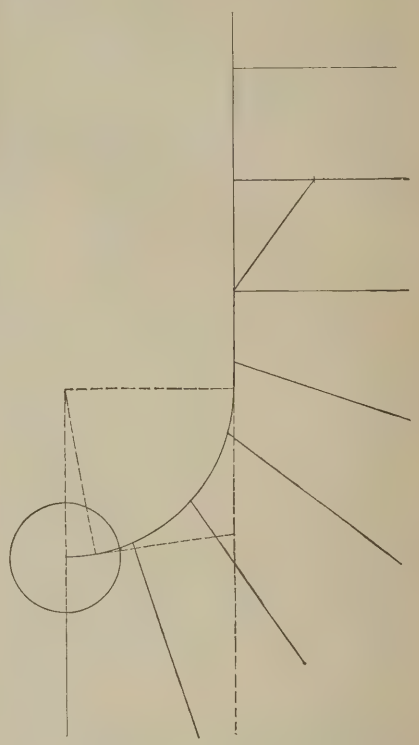


Fig. 12.—*Plan of a Quarter-Circle with Winders where the Wreath Rises to a Cap.*

where the hypothenus of the bevel triangle crosses the curve in the ground plan. Through F draw a line parallel with D D. In the elevated plane make the distance *g f* equal to *h* F. Then *f* thus found is the point desired. If the rail pattern is drawn separately, as in the article referred to, reproduce the point *f* on the rail pattern (Fig. 16). Then with *f* as a center draw the usual arcs to guide in bending the marking-rod. The piece in this case, having twist all the way

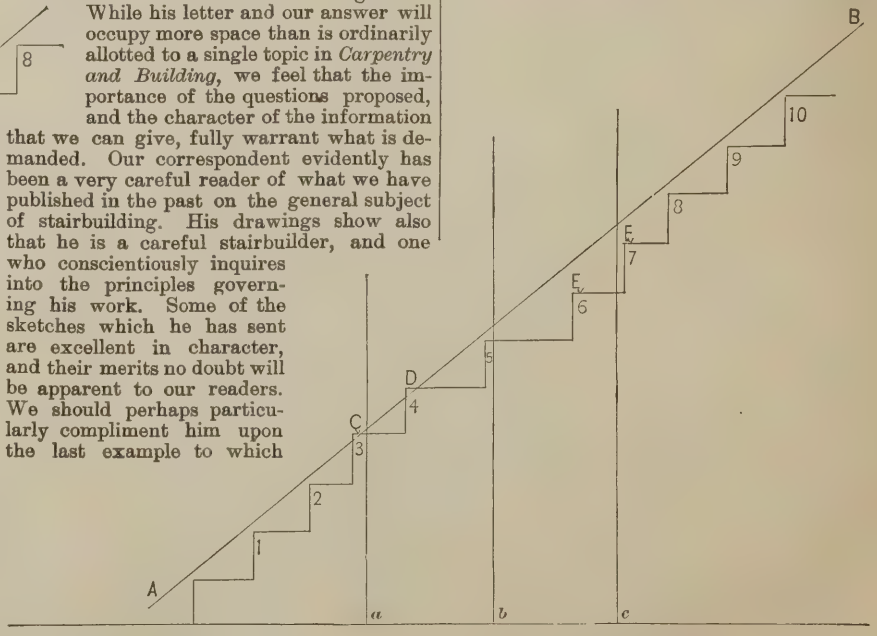
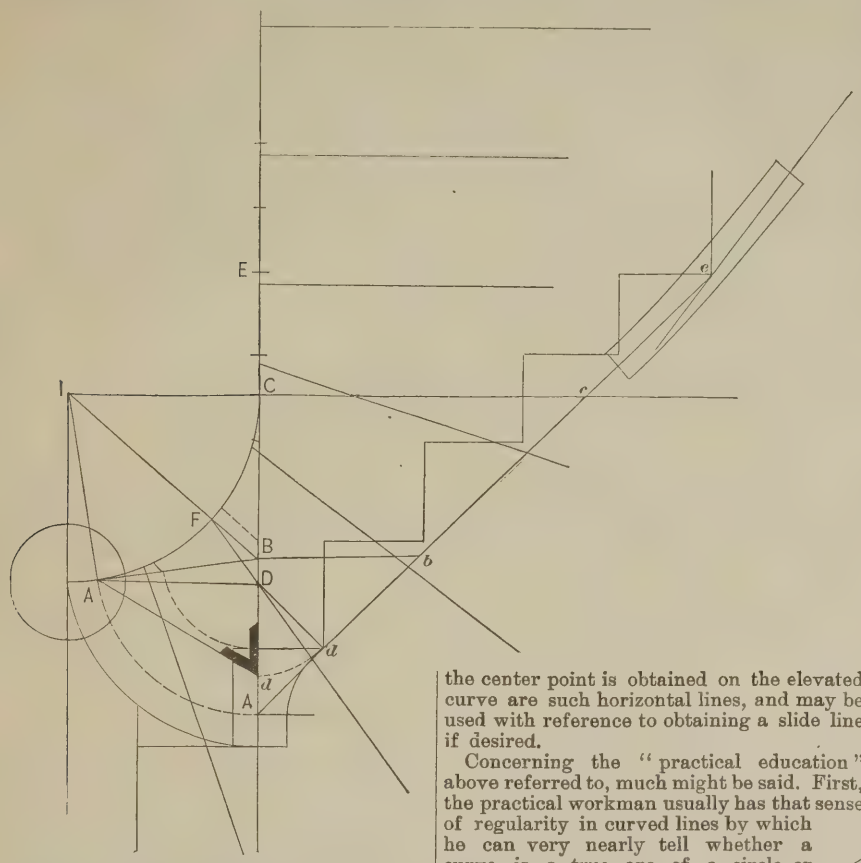


Fig. 11.—*Elevation as Drawn by S. B. to Plan Shown in Preceding Figure.*

through, will require the pattern to be about as wide in the center as at the ends.

2 and 3. As to the slide line, the face patterns obtained by the method of work we

have explained are intended only to provide the wood necessary for cutting out the rail. A pattern, to be a correct guide for use in cutting the edges of the rail, must in many instances be wider at the ends than those shown in our series of articles. Our practice has been to obtain the face mold, which



Questions in Stairbuilding.—Fig. 13.—Drawing Illustrating Solution of Problem Presented in Fig. 12.

gives only the necessary amount of wood for the rail, and then to depend upon what may be called practical education for the shaping of the twist. It happens only occasionally that a perfect form is needed for the edge of the rail. In such cases a method like that used by Riddel and explained in his works on stairbuilding may be employed. By this plan an

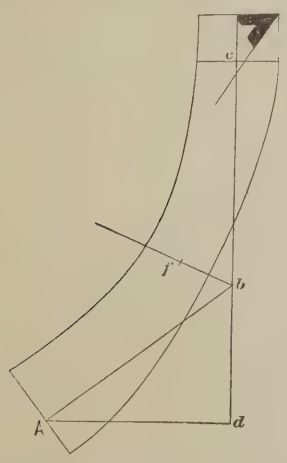


Fig. 14.—Pattern for the Wreath Derived from the Foregoing.

accurate pattern is produced for the express purpose of sliding the mold, or it may be done by cutting off the lower end of the piece horizontally from the under line of the square pattern, and the piece being set up in position, an edge line drawn with a radius stick of the proper length, the other end sliding down by a vertical center, such as the corner of a door jamb or some other upright straight edge. This way of working, although liable to the objection of inconvenience, gives perfect results. If our correspondent desires to use a slide line he should bear in mind the fact that it always lies in the direction of sharpest ascent on the elevated plane, or, in other words, it is at right angles with any horizontal line drawn across the face pattern. All the measuring lines in this method by which the center point is obtained on the elevated curve are such horizontal lines, and may be used with reference to obtaining a slide line if desired.

Concerning the "practical education" above referred to, much might be said. First, the practical workman usually has that sense of regularity in curved lines by which he can very nearly tell whether a curve is a true arc of a circle or something else. He can also determine in the same manner, when a wreath-piece is placed in position, whether the inside edge has the proper cylindrical form. Such a gift or attainment is absolutely essential in many other parts of a stairbuilder's work in which hand-made curves are necessary. Among these may be mentioned forming easements on the wall string, cutting the under-side line on the cylinder, and fitting the moldings which follow the line of the string or rail. Certain positive ideas are also necessary relating to the form of a twist. It is evident that the inside edge of a rail ascends with a sharper pitch than the outside edge, so that in placing the try-square against the butt joint at the end of the piece, the blade of the square resting on the top of the rail, the center of the surface may be square with the butt joint, while the inside and outside edges respectively will vary from a right angle according to their inclination. Placing the square the other way across, with the blade trying the outside edge, in the center the curve should start off at right angles with the joint, while at the lower side it forms an obtuse angle, and at the top side an acute angle. This is the case provided we are trying the top end of a wreath-piece which is on a continuous rake. A section of such a rail, if cut, would show a hollow edge on the inside and a rounded edge on the outside, so that the square pattern at the butt joint, to be correct, would need to be of a similar form.

In further explanation of cutting out the wreath we will refer to the rail shown in the eighth article of the series on stairbuilding, and published in our issue for April, 1881. The best thing for a beginner to do in this case would be to first cut away the superfluous wood around the square pattern near the end of each piece, and then bolt two of the pieces, or all of the pieces, together. This done, the line for cutting the inside edge may be marked with a pencil or with chalk to suit the width of the curve, using the edge of the face pattern to assist in marking, if necessary. After cutting away most of the wood a round sole plane may be used to finish with, using the plane always in the direction of a vertical line. By this means, having the whole wreath bolted together at once, there can scarcely be a failure to obtain the correct form for the inside edge of the rail. Next cut off the top of the rail, using the try-square, if necessary, from the inside edge of the wreath, holding the stock of the square in the direction of a vertical line. Since the "falling mold" has fallen into disuse no lines have been thought necessary on this part of the work, the sole reliance being the taste and judgment of the workman to produce the proper curve. This done, the outside and bottom may be gauged off, forming their corresponding sides.

4. In answer to our correspondent's fourth question we would say that in the problems presented in Articles IX to XVIII, inclusive, the principles of stairbuilding were treated in the abstract, as was stated at the conclusion of Article XVIII. The pitches and all of the lines at first laid down were more or less supposititious cases—such, however, as might occur in actual work. To find the proper inclination of tangents in any given case it is always necessary to proceed in a

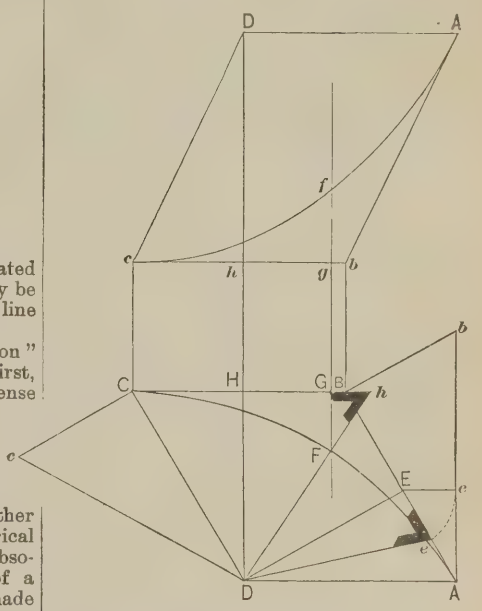


Fig. 15.—Duplicate of Fig. 1 in Article XII, Published in August, 1881, with Additional Lines and Points for Illustration.

manner somewhat similar to that shown in the subsequent articles.

5. If our correspondent's method of drawing elevations as indicated by the sketches he incloses, and which we have engraved, Figs. 1 to 8, inclusive, is satisfactory to him, he can continue their use, for he can apply our method of obtaining the bevels and drawing the face pattern without fear of

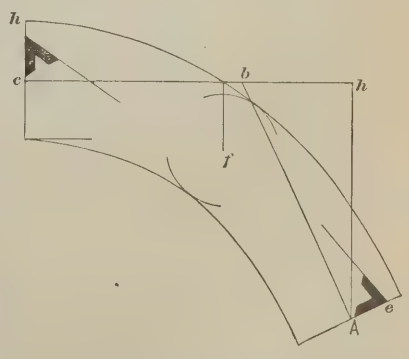


Fig. 16.—Pattern Shape Derived from the Preceding.

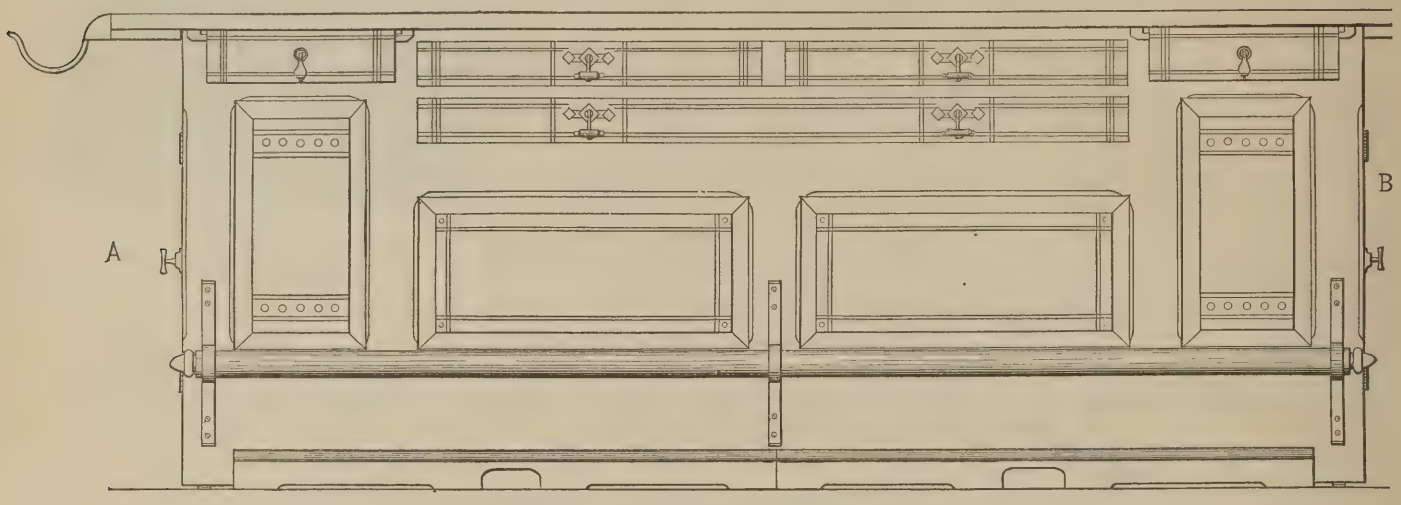
difficulty respect to the latter. In our series of articles he will notice that, where a regular elevation is necessary, the baluster points are transferred on to the tangents of the plan by lines which would be horizontal if produced in the elevated plane. This forms an accurate basis from which to draw the elevation, showing the top of the tan-

gents and the comparative hight of the balusters. By his method it would sometimes be difficult to tell how high a certain baluster ought to be; for example, in such a case as that concerning which he inquires, both as to the wreath-piece covering more than a quarter-circle, and where it eases up into a newel cap. In the plan of stairs shown with Article XXI, August, 1882, the third riser line crosses the plan of tangents near where they meet at the corner, while the line which represents the baluster meets the second tangent some distance further on.

6. In answer to the questions next proposed by our correspondent, we advise him the pattern is supposed to be the same as the natural width of the rail. It does, however, need to be somewhat wider in order to allow for the twist which is in progress at the point, as before explained. See answer No. 2, in which a section of the wreath rail is described as concave on the inside edge and convex on the outside edge.

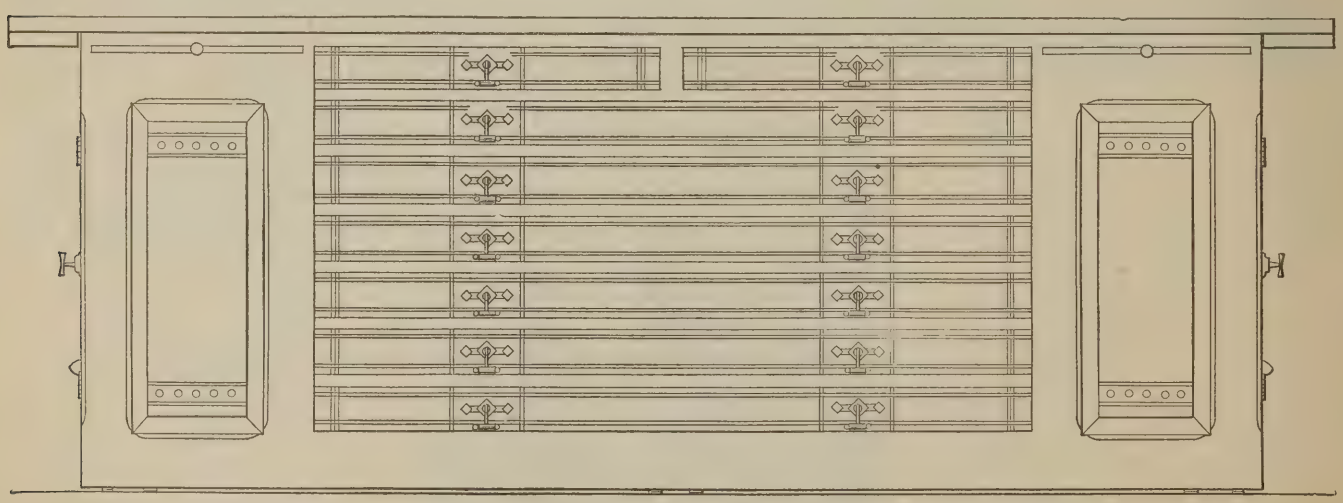
7. The width of the rail wreath referred to is the width of the rail. Face patterns which are intended only to provide the necessary wood never require to be wider than a diagonal of the square pattern.

8. Referring to the case illustrated in Fig. 12 of our correspondent's sketches, we would top of the second step. Then make the hight E *e* equal to four risers plus the 6 inches. Complete the elevation as shown, making the riser lines to represent the short balusters, except the first one, which is the true riser line of the center of the newel. Through *e* draw the pitch line of the rail, over the straight flight. Connect A *e* and draw the perpendiculars C *c* and D *b*. Then A *b* and *b c* are the elevated tangents of the wreath. Draw A D at right angles with D C, and from D draw D *d* at right angles with A *c*. Draw the arc *d d* and the bevel line *d* A. Both pitches being alike, this bevel answers for both ends of the twist.



Drafting Table, Designed by W. B. Hanlon.—Draftsman's Front.—Scale, ¾ Inch to the Foot.

to draw the perpendicular O *o*, Fig. 9, on the opposite side of the figure, and equal in hight to D *d*. Reproduce this line on the elevated plane by drawing *o d*. Make *o f* equal to O F in the ground plan. Then *f* is the center point in the elevation through which to draw the curved line. In Fig. 9 the solid lines represent the diagram as received from our correspondent, while the dotted lines are additions which we have made, as described above. The method we have indicated differs from that pursued by Mr. Monckton, yet we take pleasure in saying that we believe his method to be equally correct. Each of the two plans for the purpose has its own peculiar advantages. By our method we obtain the point nearer the center of the curve, and therefore find it a better guide in bending the marking-rod. Our method also consumes less space on the stuff from which the pattern is to be cut. This is often an important advantage. By the method here shown a point is obtained in the curve where the rail lies parallel with the face of the plank, so that the thickness of the rail may be gauged in the center and from the face of the plank. This also furnishes, to those who wish it, a guide in cutting the top surface of the rail. Where such a line crosses the face pattern the width of first make a wreath in the usual way as to its edges, and then form an easement at the lower end as we would with any straight block. It is necessary in such cases to have a tolerably thick piece of wood, so as to allow for a rise of the easement at the bottom. The center line proper is also for this reason located as near to the under side of the plank as the twist at the top end will admit. Referring to the plan, Fig. 13, in the miter of the rail with the cap, suppose A to be the point of the miter; draw A B tangent to the circle at A; extend the line C B and transfer the distance C B A on to the line C B A, thus furnishing the stretch-out of the tangents A B and B C. Suppose the hight of a riser to be 8 inches, and assume that 3 inches is sufficient to allow for the rise of the easement. We will also assume that in this case the center of the cap is 1 inch higher than the ordinary long baluster. Consider both of the elevated tangents to have the same pitch, which we will be safe in doing, since the winders are quite regular. Draw the measuring line I F B. Transfer the short baluster points on to the tangents by lines drawn parallel to I B. In the elevation of tangents, suppose A, the beginning of the first tangent, to be 6 inches below the In drawing the pattern for the wreath as shown in Fig. 14, make *c b d* equal to *c b d* of the plan. Draw *d* A at right angles and equal in length to the bevel line *d* A of the plan. Draw A *b*. Draw the measuring line *b f*, dividing the angle A *b c* and making the distance *b f* equal to B F on the plan. At the top, add 4 inches of straight wood and make the pattern as wide as the diagonal of the square pattern. At the bottom end make the inside edge sufficiently wide to allow for an easement. Make the width at *f* a little more than the flat width of the rail. Draw the curved lines in the usual manner. If the piece is short, the curved lines may be drawn by hand without a rod. By this means we have the necessary wood for the required piece. In working, cut off the lower end plumb up from a level line drawn across the butt joint at the end of the tangent. On this face place the square pattern with the center 3 inches above the level line. From this end the easement may be cut to suit the eye, and at the top end cut to conform with the ramp which meets it.

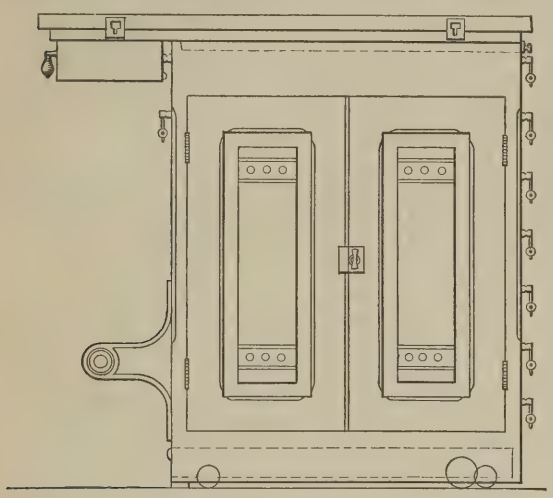


Drawer Front.—Scale, ¾ Inch to the Foot.

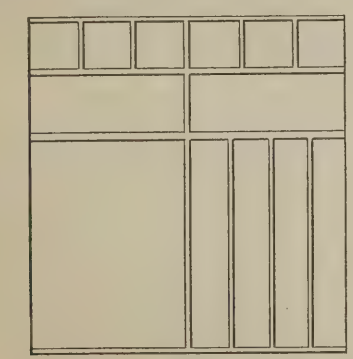
9. In answer to our correspondent's question No. 9 above, it may be said that either of the two ways is right in itself. Sometimes one way of doing a thing is best and sometimes another. In Article X the center point

is located on the plan where a line drawn parallel with A H will be tangent to the curve, thus in two ways serving as a guide in drawing the elevated center line. In Article XXI, the pattern being somewhat longer, it seems necessary to locate a point nearer the center of the curve. Both have their base in the same bevel line, which bounds a supposed vertical plane extending over A H in Article X and A E in Article XXI. The first is measured from the line at a certain convenient point, while the second is located on the line where it crosses the curve. As to drawing the elevation, the steps and risers are drawn to represent the location of the short balusters, those on the curve being transferred to the second tangent by lines drawn parallel with the level tangent A B. The hight *m* B is from the floor line to the center of the cap, one riser and a half, making the hight of the newel above the first step to correspond with the hight of an ordinary long baluster. At the top end the ramp which joins the wreath is not drawn out in full on the first elevation, but appears on the second elevation in connection with the rail above.

10 *a*. Tangents to a circle which intersect are always of equal length. The turn-out in Article XX is made on an eliptical plan, which accouts for the tangents being of different lengths. *b*. Our answer above replies also to the next question in order. *c*. In Article XX the text reads, "on the line C B, suppose B to be the natural place of the first long baluster." By this is meant the place where the long baluster would be if there was no turn-out. This point is selected from which to draw the level tangent, so as to make the newel come the right hight.



Drafting Table.—End Elevation.—Scale, ¾ Inch to the Foot.



Divisions in Case at End B.

11. We have already referred to our correspondent's drawings shown in Figs. 10 and 11. The risers running in the direction they do, the elevation he has produced is as good as any for his purpose.

In the foregoing we have attempted to answer our correspondent's questions in detail, and, if in any respect we have failed to give him the information desired, it is because we have not fully comprehended his wishes. We trust our answer will be of as much benefit to him and to other interested students of the art of stairbuilding among the readers of *Carpentry and Building* as he anticipates.

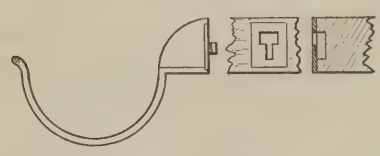
Drafting Table

From WILLIAM B. HANLON, *Bridgeport, Ohio.*—I inclose you the drawings of a drafting table that I have had built for my own use. A description of it is necessary to understand some parts that are not clearly indicated in the drawings. The table top is hinged to the drawer case on the draftsman's side, allowing it to be tilted, thus making it more convenient in working out large plans. The three top drawers extend through the case and are accessible from either side. The two top drawers measure inside as follows: 2 feet 4 inches x 2 feet 3½ inches. The depth is 2⅞ inches. The remaining six drawers are of the following dimensions: 2 feet 4 inches x 4 feet 10½ inches, and 3 inches deep. The casing at the ends is 18 inches deep, and is suitable for files of magazines, atlases and building books. The foot boards shown on the draftsman's front are 3¼ inches high, and extend back the full depth of the case. They are provided with two wheels under the rear end of each. The case complete rests on four piano casters, by which it is easily moved about the room. The case I am using was made of black walnut with white-pine top. It was built by R. J. Baggs & Sons' Lumber Company, of this place, at a cost of $140. I trust this piece of work will be of as much interest to the readers of *Carpentry and Building* as all similar plans heretofore published in it have been to me.

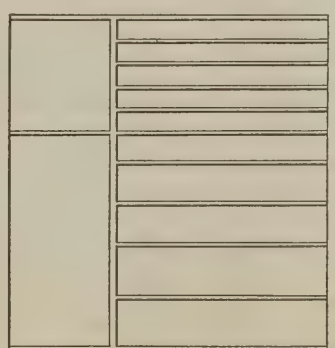
Old Subjects Revived.

From J. D. R., *Syracuse, N. Y.*—May I venture a suggestion for the benefit of the readers of *Carpentry and Building?* It is as follows: Whenever one makes a plan to illustrate how bevels and carpenters' cuts generally are obtained, let him write his full name and post-office address, so that communications for the future may be addressed to him, instead of being necessary to pass through the Editor's hands and fill up the columns of the paper. Had this been done I would not be troubling you with questions that perplex me and I presume annoy you. "W. G. P.," in the March issue, gives a method of obtaining the shape of a hand-rail, and says, "I think the diagram needs but little explanation." That is its chief fault. Take the diagram of "M. L. G.," in the December number, to which this correspondent refers. Place them side by side and give them to a skilled wood-worker or a stair-builder, and ask him to construct a hand-rail from the plans. I will venture the cost of the rail that he could not do it. Why not? First, because there is no method given by which to obtain the curved lines in the face mold. Second, there are no lines given to obtain the falling mold. Third, there is no reason given for placing the joint in the rail in the center. Fourth, what are the marks across the dotted lines for except to confuse and lead one to run to the confessional for indulging in naughty words which this state of affairs provokes? If the author were a neighbor of mine I would step into his shop out of business hours and criticise his lines more sharply, but he is far away and a stranger. I am reminded that "stranger" is a holy name. "Favor and rest and food and fire, he never must in vain require." Therefore, please speak to him kindly and ask him to explain why it is done so, to the end that, when my boss asks me to build a flight of stairs with a cylinder at the landing, I can do it, put the rail on complete, and have the satisfaction of knowing that my wages will be raised the next Monday morning.

Plan of Paper Holder.—Scale, ¾ Inch to the Foot.



Sectional View of Paper Holder.—Scale, 1½ Inches to the Foot.



Divisions in Case at End A.

Note.—We take pleasure in publishing this letter from a correspondent who has frequently favored us with interesting communications. We understand that he would like to organize an "ever-circular" or get up what is sometimes called a correspondents' club among the contributors to the paper, so that each might have in effect the satisfaction of visiting the other and talking over the problems in which they are mutually interested. We cannot say that it is on account of the modesty of the contributors to *Carpentry and Building* that their names are commonly abbreviated to mere initials. It is rather on account of the habit of the journal in that respect, and therefore our contributors should not be taken to task for not having their names printed in full. On the other hand, we doubt very much if those who send us letters occasionally would desire to have a considerable proportion of the 100,000 readers of this paper writing them from time to time, asking for further explanations about their diagrams or taking exceptions to their methods and conclusions. If this plan were inaugurated, many of them would soon be in the position of the Editor, who frequently has far more correspondence to attend to than he knows how to manage—that is, with personal comfort to himself. Further, they would be in constant receipt of communications that require expert talent to decipher and determine what the writers really mean to say. As it is at present, the Editor undertakes to do this for the craft at large, and without egotism we venture the opinion that were the individual correspondents to undertake to do this they would soon give up in despair. Few who see our published letters have any idea of the crude material that is occasionally poured into our hopper to be ground out for the edification of our readers. We are glad to publish the general comments from this correspondent on the manner of explaining diagrams. The contributors whom he criticises were undoubtedly under the impression that those who are interested in their communications are already informed in some measure upon the general subject treated, and are in possession of that which had been previously published on the same topics in these columns. Our correspondent makes some good points, and we commend them to the attention of our readers. It is very seldom that a diagram is sent in with too much explanation. Very frequently, however, we have occasion to regret that a really good piece of work is spoiled from the lack of enough explanation to cause it to be comprehended by the reader. Occasionally we attempt to supply omissions of this kind, but when we do so the question

naturally arises whether the article so produced is our own or our contributors'. We ought not to be asked to do any more than to carefully edit this department.

TRADE NOTES.

THE COMPOSITE IRON WORKS COMPANY, 83 Reade street, New York, have issued some supplementary sheets to their catalogue, copies of which have recently been delivered to their customers. Among the designs shown may be mentioned an altar railing recently made for the Church of the Sacred Heart, New York City, to designs prepared by N. Le Brun & Son, architects. There is also shown on altar railing designed by artists in the employ of the company; a design for a continuous iron balustrade, and a design of a doorway protected by the Bostwick patent folding steel gate, surmounted by a wrought-iron grille, are also given.

LANE BROS., of Poughkeepsie, N. Y., on the 1st of July changed the discount on Lane's patent steel door-hanger and track. The price at which these goods are at present sold is 30 and 10 per cent. discount from list at Poughkeepsie or New York City. The Lane hanger, the manufacturers believe, more nearly approaches an anti-friction hanger than any other in the market, and it is one of which the greatest care is taken with reference to workmanship and material. We understand that largely-increasing orders for this specialty attest the appreciation of the building public with it. Messrs. John H. Graham & Co., No. 113 Chambers street, are the New York agents.

WE HAVE RECEIVED a copy of the illustrated supplement to his catalogue of fine building hardware, issued by A. G. Newman, 1180 Broadway, New York. The pamphlet is a large quarto of 20 pages, and contains some very handsome engravings of front-door mortise locks, vestibule mortise latches, mortise locks for inside doors, mortise locks for sliding doors, sliding-door lock escutcheons, bronze door knobs, bronze loose-pin butts, front-door electric push buttons, flush sash lifts, bronze drawer handles, bronze shutter knobs and other goods. The designs shown represent selections from the finest art goods that are now on the market, and many of them have been prepared, as we learn by the preface, to gratify the fancy and refined taste of those who have an eye for the beautiful. The engravings are of a very high order of art, and show the really fine goods which they illustrate to marked advantage.

WE HAVE REFERRED in the past to the frequent renovation of marble fronts in this city, and have described some of the methods that are employed for this purpose. A very common one is rubbing or scratching the surface of the stone until it appears new and bright. The Brick and Stone Water Proofing Company, with office at No. 55 Broadway, this city, instead of abrading the surface employ acids. They have been recently engaged upon the front of a prominent insurance building near the lower end of Broadway, and their work has attracted marked attention upon the part of passers-by.

THE VICTOR DOOR KNOB COMPANY, whose special construction of door knob we illustrated and described in the July issue of *Carpentry and Building*, have opened a New York office at No. 118 Duane street, at which place a full line of goods, together with samples, will be carried.

WE HAVE RECEIVED from M. J. Hynes & Bro., Toronto, Ontario, a copy of their sample sheets illustrating tile, terra-cotta mantels, dadoes, keystones, crestings, finials and other similar goods. The circulars have been prepared in the latest fashion of art, and contain among other features elevations of two houses in the embellishment of which terra-cotta work has been lavishly employed. The circulars also show an interior view of a room in which terra-cotta and stucco work are prominently displayed. A number of detached designs illustrate, in addition to the articles above enumerated, string courses, plaster center pieces, trusses and brackets.

AT THE New Orleans exposition, recently closed, the Black Diamond File Works, Messrs. G. & H. Barnet, proprietors, Nos. 21 to 43 Richmond street, Philadelphia, were awarded two gold medals—one for the best quality of files and rasps, and the other for the best display of files and rasps.

WE HAVE RECEIVED from Messrs. Cutting & Delaney, manufacturers of artistic wood work, Buffalo, N. Y., a card showing their specialties, and more particularly Japanese fretwork for grills. Work of this kind is becoming very popular for screens, light partitions, door and window decorations and in other places. This firm inform us they are the only concern in this country who are making a specialty of this work. They are supplying the work to the trade and also to order. The firm also make a specialty of wood mantels, fine carvings, bookcases and cabinet-work generally.

RAND, MCNALLY & CO., of Chicago, announce that the edition of their "Directory and Shippers' Guide of Lumber Mills and Lumber Dealers" is now in press and will be ready for delivery very soon. We reviewed the edition of this work for last year, and at that time gave a general list of its contents. The present edition will contain, besides the list of mills and lumber dealers in the United States and Territories, the names of all railways and express companies by which the various cities and towns where the above interests are located may be reached, together with colored maps of each State and Territory in the United States, showing the line of every railroad. There will also be given digests of the law of mechanics' liens and the laws governing the cutting of timber, &c.

IN VIEW of the fact that the use of foundation slate as a preventive of dampness in foundation walls is constantly increasing, Messrs. Boyle & Co., 419 Walnut street, Philadelphia, have made arrangements for supplying this kind of material at a moderate price. In a circular issued by them they solicit correspondence on the subject with masons and builders.

THE WILLIAM L. PERKINS MANTEL AND GRATE COMPANY, 94 and 96 Elm street, Cincinnati, in a letter to the trade announce the dissolution of the firm of William L. Perkins & Co. The company named have recently been organized, with William L. Perkins as manager. The new concern will occupy the factory on Elm street, as noticed above, and will keep in their employ all the salesmen, bookkeepers, marbleizers and artists, besides nearly all the factory hands, of their predecessors. The circular-letter states that, having no old patterns, they are prepared to offer exceptional inducements in design, finish and price. Their catalogues will be distributed at an early date.

THE BODINE ROOFING COMPANY, of Mansfield, Ohio, inform us that the Ohio State Board of Agriculture, after examining very carefully the merits of the Bodine roofing in competition with other roofing materials, have recently placed an order with the company for 1000 squares. This material is to be used on the new building to be erected on the State Fair Grounds at Columbus, Ohio, to be ready for use by the time of the fall exhibition.

IN ANOTHER column in this issue the Taft Company, of Hartford, Conn., whose natural wood ornaments we described and illustrated a short time since, invite the trade generally to send for a copy of their catalogue. As mentioned in the article above referred to, their ornaments are distinguished for being clean-cut and finely finished.

WE ARE INDEBTED to Orrin D. Person, 123 Fifth avenue, New York, for a handsome photograph of the new residence of Mr. G. F. Baker, of the First National Bank of this city, erected at Monmouth Beach, south, N. J. The building is a novelty in its way, one of the most conspicuous features about it being the extensive use of vitrified roofing tile, which were furnished by Mr. Person. The roof is covered with this material, as also are the walls of the second story. Several different patterns are employed, producing a very pretty effect, and one which has been employed by the architect, Mr. Bruce Price, of this city, to the best advantage, in combination with other features. The hip rolls and crestings are of the same material. Mr. J. K. Smith, of Waterbury, Conn., was the contractor for the tilework.

MESSRS. J. B. SHANNON & SONS, 1020 Market street, Philadelphia, announce a new illustrated catalogue of builders' hardware, with greatly reduced prices. Those of our readers who have become acquainted with the excellent trade publications issued by this firm in the past, will be eager to procure a copy of this new book.

ADJUSTABLE SASH BALANCES, which are described as mechanical substitutes for sash weights, are manufactured by Robert B. Hugunin, Hartford, Conn. In his card, published elsewhere in this issue, Mr. Hugunin warns purchasers against fraudulent imitations, and specifies the styles which have been put upon the market without proper authorization. These styles, he says, further, can be purchased of him at half-price. Sample sets of the Hugunin sash balances can be procured by mail.

STABLE FITTINGS, hay racks, mangers, stall posts, roof crestings, &c., are goods announced by Samuel S. Bent & Son, No. 111 Chambers street, New York. The trade are invited to send for catalogues.

MESSRS. BAKEWELL & MULLINS, Salem, Ohio, call attention in this issue to sheet metal capitals, architectural ornaments in sheet metal, sheet-metal statuary, and to other goods in the same general line which they are manufacturing. Their catalogues are very complete and show a large assortment of designs.

BULLARD & GORMLEY, 106 Lake street, Chicago, are inviting attention to their parlor door-hanger, known as the "Standard." The merits of the device, which is described as absolutely anti-friction in character, are briefly stated in their card in another column.

CATALOGUE "C," issued by the Hanika Iron Fence Company, Springfield, Ohio, relates specially to cast and malleable iron crestings, finials, tower ornaments, weather vanes, stable fixtures and other similar goods. Contractors and builders are invited by the company's card, in another column, to send for it.

T. A. BARNES, of New Haven, Conn., who is manufacturing the Ellrich patent socket and ratchet screw-driver, recently described in our "Novelty" department, announces that these goods can be ordered through the general hardware trade. A descriptive circular will be sent to all applicants.

A PROMINENT FEATURE of the New Orleans exposition was the extensive display of wood-working machinery. What was called the Wood Working Machinery Annex contained, it is believed, the most varied and complete display of wood-working machinery ever seen on this continent. As the United States is ahead of other countries in the production of this particular class of machinery, it follows that the exhibit referred to was the most extensive the world has ever seen. Prominent among the exhibitors were the S. A. Woods Machine Company, of New York. Eight different machines were exhibited for competition by this company, namely: Fast feed flooring machine, molding machine, planing and matching machine, jointing machine, circular-saw machine, planing machine for matching two boards at a time, panel planer and shop surfacer, and eight gold medals of the first class for superior excellence were received by this company.

CATALOGUE No. 4, issued by J. E. Bolles & Co., Nos. 80 to 84 West Woodbridge street, Detroit, Mich., is at hand. The specialties manufactured by this firm include builders' ironwork, roof crestings, fencing, railings, weather vanes, stable fittings, bank and office railings, wire partitions, window-guards, sidewalk lights and many other correlated branches of ironwork. The catalogue is larger than any that has preceded it, and includes nearly 100 pages. It is profusely illustrated.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME VII. NEW YORK=SEPTEMBER, 1885. NUMBER 9

The Potter Building.

One of the most conspicuous new buildings in the lower part of New York City at the present time is the Potter Building, on the corner of Park Row and Beekman street, which is now nearing completion. This building occupies the site of the old World Building, the destruction by fire of which, some five years since, resulting as it did in large loss of life, was very generally published throughout the country. The building is just across the street from the Post Office, and is only a short distance from the Tribune Building, whose hight, when it was first erected, was considered something marvelous. The new building stands directly in front of the Morse Building, which was described in detail in our issues for June and July, 1879. This building, at the time, we described as being among the tall buildings of the metropolis, but the new edifice hides it completely. The Potter Building is noticeable to the casual visitor particularly on account of its hight, and also on account of the combined use of iron and brick on the outside walls. In proportion to its hight the ground dimensions of the building seem small. It has a frontage of 97 feet on Park Row, a depth of nearly 145 feet on Beekman street, and a frontage of 90 feet on Nassau street at the rear. The hight of the roof above the sidewalk is 165 feet, while the hight of the highest point, being a pinnacle-shaped ornament in the front cornice, is 195 feet. There are 11 stories above ground and two below the level of the street, making it in reality a 13-story building. All of the stories above ground, as may be seen by the figures above given, are of good hight. The structure was commenced in the spring of 1883, and will not be finished before the spring of 1886. It will be devoted to offices, of which it contains 200. This scarcely expresses the real capacity of the building, from the fact that many of the offices are so large that tenants will subdivide and sublet them until the real number of the rooms will be considerably in excess of this number.

A prominent feature of the building is the extensive use of terra-cotta. The trimmings of this kind were furnished by the Boston Terra Cotta Company, and no less than 200 tons of this work have been used. The front of the principal story and the story immediately above it are of cast iron. Iron trimmings are also used in some of the stories above these, and a judicious combination of iron with brick, and iron with terra-cotta, is a marked feature of the exterior treatment. Several contractors have been engaged in the ironwork of this building. The contract was originally let to the New York City Iron Works, who were succeeded in this work by J. M Duclos & Co., and they in turn by H. W. Adams & Co., while the Lehigh Iron Company completed the work. This building is regarded as nearly fire-proof as it is possible to make a business structure. The iron floor beams and iron columns supporting the floors are

PORTION OF THE BEEKMAN STREET FRONT OF THE POTTER BUILDING, NEW YORK.

all carefully incased. The columns are inclosed in a brick casing with interior air space, so as to fully protect the iron from the effects of heat in case the contents of any of the rooms should burn. There is a massiveness to the building produced by the thickness of the outside walls, which in the first story measure 4 feet and over, and by the size of the inside columns and piers, owing to the features of construction above referred to. The floors are composed of hollow brick, and the division walls are also of brick, all being arranged to make a fire practically impossible.

Our first-page illustration shows some of the general features of the exterior work of this building. It represents portions of the second, third and fourth stories on the Beekman-street front. The pediment in the center is a top finish, for a section of the building at this line is recessed back to form a court, and the work that we have illustrated in the engraving is the finish of that part of the building below the opening of the court on the Beekman-street side. The view we have presented is of interest to our readers as indicating features of construction and design in the ironwork. The engraving was made from a photograph, and is correct in all its details. The architect of this building is N. G. Starkweather, of New York.

The Pitch Lake of Trinidad.

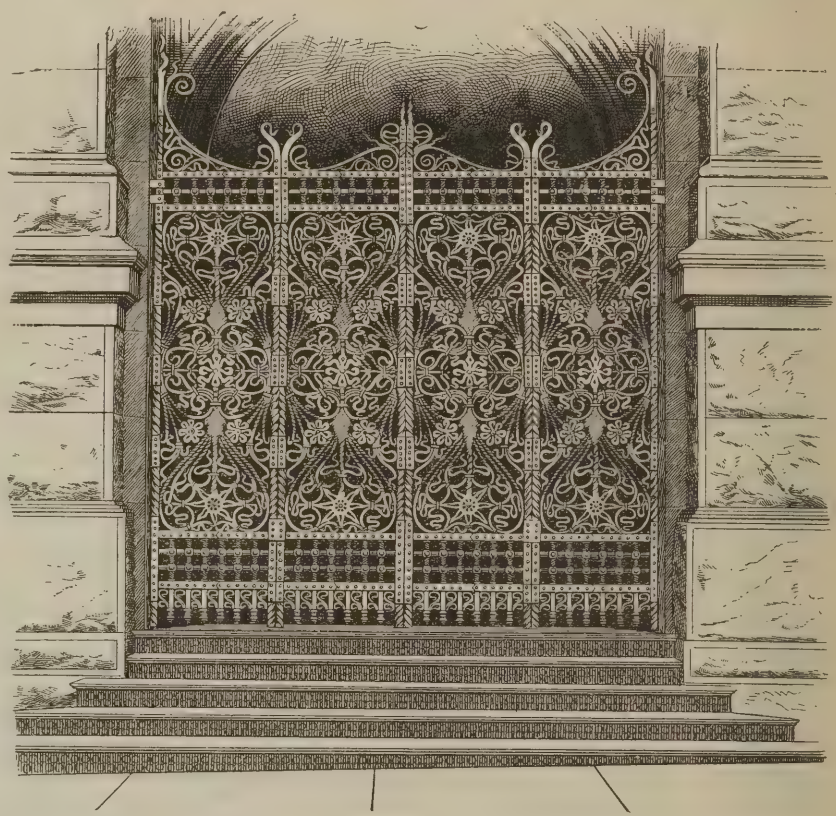
Most of our readers are somewhat acquainted with natural asphalt and various preparations of bitumen. The following account of the Pitch Lake in Trinidad, from which a considerable supply of material is obtained bearing the name of Trinidad asphalt, will prove of interest:

The most remarkable feature of Trinidad is the Pitch Lake. It is about 1½ miles in circumference. The pitch at the sides of the lake is perfectly hard and cold; but as one walks toward the middle with the shoes off, in order to wade through the water, the heat gradually increases, the pitch becomes softer and softer, until at last it is seen boiling up in a liquid state. The air is then strongly impregneted with bitumen and sulphur, and the impression of the feet is left upon the pitch. It is possible during the rainy season to walk over most of the lake, but during hot weather a great part cannot be approached. The following account is from the narrative of a gentleman who visited it from San Fernando: "To get to the lake it was necessary to sail 10 miles on the Gulf of Paria. The course lay along the shores of the district of South Naparima, with cane cultivation coming down nearly to the water's edge, and the planters' houses placed so as to command good views of the sea; then past the swamp called, *par excellence*, the lagoon, which fronts the sea for 3 or 4 miles and extends far into the interior, a fertile source of agues and fevers to the estates adjoining, especially to leeward. Then came some more miles of bush, and then our destination, the beach and village of La Brae, which signifies pitch.

Nothing could be more appropriate than the name, for it is pitch here and there and everywhere. It is the shore—it is the bed of the sea as far as you can trace it. It is the street and the surface of the ground. It forms the floors of the houses, and is under the vegetation which flourishes with tropical luxuriance all around. The road proceeds almost in a straight line from the shore for about a mile to the borders of the lake, which is wholly covered with pitch, presenting the appearance of motion, though quite hard (when he visited it.) It appeared as if wave after wave was coming on, each one having sufficient consistency to preserve its crest, as if the ripples on a level seashore had been suddenly arrested and solidified. The pitch is quite level with the edge of the basin. It was our intention to proceed toward the middle of the lake, and after we had spent some time on the border, surveying the singular scene, we began to put our intention into effect. The sides of the hummocks were slippery and very steep, but we pursued our way till we arrived near the middle, where was a larger flow of pitch than any we had crossed. Some guava bushes afforded shelter from the sun's rays, and there we halted. The stillness was very marked. Not a sign of animal life but what came from our own party, while the black-brownish hue of the surface of the pitch added to the monotony of all around. Yet even here were the guava bushes growing, without any visible soil to nourish them, although probably a cropping-up of soil in the lake gave them place to strike root in. The water in the lake is so slightly tinged with the taste of pitch as to be drinkable, and there are many places where those inclined to bathing can indulge their wish."

Iron Gateway.

The accompanying illustration shows a massive iron gate that finishes one of the entrances to the Washington Building, erected at the lower end of Broadway, this city. It constitutes an interesting addition to the series of illustrations of modern ironwork which we have been presenting. The gate is of wrought iron, and the design has been most faithfully worked out by the mechanics who have constructed this work. The entrance in question faces Battery Park.



Iron Gate in Doorway Facing Battery Park, Washington Building, New York City.

The steps shown are finished with illuminating tile, which afford light to the basement. This work was executed by Messrs. J. B. & J. M. Cornell, of this city.

The Results of the Year's Building Business.

A few months since we presented a general survey of the building prospects of the entire United States. Our report was based on advices from a large number of correspondents located not only in the prominent centers of the building industry, but also in all the other towns and cities throughout the Union. At that time we pointed out that, while the year's business in a few prominent cities and in certain favored sections of the country was likely to be very active, there were other localities in which the indications pointed to unusual dullness and depression, yet the aggregate would show for the year an average amount of building. Since the publication of that report the season has so far advanced as to warrant a second examination of the field from which to judge how far our predictions are being realized. *Bradstreet's* correspondents in leading cities throughout the United States have recently given the question of the amount of building being done very careful attention, and their reports, with information derived from our own resources, form the basis of the following very general account. Our contemporary, in referring to this matter, points out that the era of depression in trade has at last had its effect upon the building industry as well as elsewhere. Real-estate investments have been among the last to feel the effects of hard times, but they are generally among the first to recover therefrom. When other forms of investments appear of doubtful desirability, capital is ever ready to flow into city real estate. When taking the form of improvements on real estate, however, the investments are more likely to show the effects of a prolonged period of stagnation in trade.

In attempting a summary of the building business in the leading cities the inquirer is met at the outset with discrepancies in the methods of managing building permits in the different places. For example, in Philadelphia, only the total number of building permits issued is available, while in some of the other cities not only the total number of permits, but their cost, is given. Hence there is no adequate basis of comparison. According to the books of the building inspectors in Philadelphia, there has been a steady growth in building enterprises in that city for several years past. In 1883 permits for the construction of 4390 new buildings were issued. In 1884 the number was 4999. For the first six months in the present year there were issued 4427 permits for new buildings and alterations. Owing to the method of keeping the records in this city a separation of the items so as to show the proportion of entirely new buildings is not possible. Everything points, however, to a large increase in the aggregate for the year.

In Boston the figures given for the new work authorized since January indicate that the total number of brick buildings put up or begun this year will be about 20 per cent. less than last year, and of wooden buildings 13 per cent. more than last year. While it is not likely that the permits for the entire year will be exactly double those of the first half, the approximation will be close enough for an estimate. The falling off in brick, stone and iron permits in this city is noteworthy. This diminution points to a considerable reduction in the expenditure for

new structures as compared with last year. The gain in number of miscellaneous wooden structures in point of cost will by no means offset the loss on more substantial work. Beyond the continuation of work on a few large buildings begun some time ago there is comparatively little doing in the business part of the city, nor is there much special activity in the suburbs In the outlying suburban towns and cities within 10 miles of the City Hall, Boston, relatively more dwellings have gone up within a year or two than inside of the city limits.

In New York City the cost of the new buildings already projected is quite up to the record at the same time last year. A short drive about this city is all that is needed to convince one of the enormous sums going into palatial new business structures, or into long rows of apartments or other residences. The costs of buildings erected in this city in 1882, according to the records of the department, were in round numbers $44,800,000. In 1883 they were $44,300,000. In 1884 they were $41,500,000, while for the first six months of the present year they aggregated $25,800,000.

At Pittsburgh the number of buildings being erected is not as large as the like portion of the two preceding years, yet those now going up are of a better class, and it is thought the amount invested before the close of the year will fall but little, if any, short of 1883. Two prominent public buildings are in progress in that city. The county is erecting a court house and prison at a cost of $2,225,000, while the United States Government is building a custom house and post office at a cost of $2,000,000. The number of permits issued in Pittsburgh during 1884 was 1846, aggregating a cost of $3,262,000. For the first six months in the present year there have been issued 650 permits, representing an expenditure of $1,500,000. The public buildings above referred to are not included in these figures.

In the Northwest, represented by St. Paul and Minneapolis, the building business is perhaps almost as active as anywhere in the country the present year. At the same time the sum total being invested in these two towns, in the light of figures published, appears to be slightly less than any year just preceding. In St. Paul last year there were three or four exceptionally large buildings and blocks put up, among which may be mentioned the Hotel Ryan, the cost of which alone was $1,000,000. Another important building was the German-American banking house. The improvements for the present year, it is estimated, will reach fully $6,000,000. A court house is in progress which costs $700.000 At Minneapolis we are informed building operations will show a full average as compared with preceding years. The improvements in that city during 1884 aggregate $7,600,000, as compared with $9,400,000 for the preceding year. For the first six months of the present year 1670 permits have been issued, representing an expenditure of $3,500,000.

The most rapid increase in the construction of new buildings at any large city, as shown by the figures before us, has been in San Francisco. According to the *California Architect and Building News*, the improvements in that city in 1883 amounted to $5,262,000 In 1884 1127 permits were issued, representing an expenditure of $6,300,000. For the first six months of the present year 741 permits were issued, representing improvements to the value of $4,500,000. The total for this year shows a gain of nearly 500 per cent. per annum over what was done in 1880. The increase has been steadily maintained during 1884 and 1885, notwithstanding dull times.

In the enterprising town of Burlington, Iowa, the improvements in 1883 were valued at $600,000. In 1884 they represented $400,000, while for the first six months of the present year they represented $300,000. The value of the buildings reported for 1883 was swelled by a few specially heavy items, including a grain elevator at $200,000, a block of offices and a church. For the six months just closed the permits have included no specially large items. From this it will be seen that during the present year there has been particular activity in that city, and this has been manifested in the erection of small dwellings, which, we are informed, are mostly frame, costing from $800 to $1500 each, and a few residences ranging from $3000 to $10,000 each. It is estimated that there are at present about 200 dwellings in process of erection in that city. Reviewing the building operations of Burlington in a general way it may be said that, omitting buildings of a special character and size, there was a slight increase in 1884 over the previous year, while so far in 1885 there has been a much larger number of buildings erected than in any corresponding seasons heretofore.

There are many other towns and cities in the country concerning which a similar array of figures would be of interest, but the space which we can devote to this subject, as well as the lack of figures in some instances, prevents their publication. At Augusta, Ga., there is less building going on than at any time in four years. At Memphis, Tenn., the buildings erected the present year are mostly cottages and residences, while in the two years previous a larger proportion of business houses was put up. At Indianapolis there will be almost as much building this year as last, but not so much money has been spent on repairs. The buildings put up are mostly homes; there is not much doing in the erection of business blocks or manufacturing establishments. At Savannah, Ga., the building boom still continues. The result is that the city is extending its limits to meet the wants of a growing population. The aggregate improvements for the first six months of the present year in Nashville, Tenn., are given at about $230,000. The total for 1884 was about $530,000. In Chicago the investments in buildings this year are considerably less than last year. Many enterprises commenced during 1884 have been completed during the present year, and mechanics have been kept fairly busy. The building business is only moderately active in Cincinnati, Louisville and St. Louis. Throughout the large number of cities and towns and in the agricultural districts of the Eastern, Central and Western States building operations are fairly active, although not fully up to the high-water mark of the last two years. Mechanics are fairly busy, and in most instances they will be kept employed to the end of the season.

Our contemporary quoted above presents some totals that may be of interest to our readers: The number of new buildings erected in 16 leading cities of the country in each of the last three years is given, and also their total cost. The cities included in this estimate are as follows: New York, Boston, Philadelphia, Pittsburgh, Indianapolis, Detroit, Leavensworth, Chicago, St. Paul, Minneapolis, Burlington (Iowa), Nashville, Memphis, Savannah, Augusta and San Francisco. Other cities might have been included in the list, and we suppose it has been made up as it is only on account of the information at hand, and not on account of the relative importance of the cities as named. The total number of new buildings in these cities during 1882 was 20,261. In 1883 the new buildings numbered 24,996. In 1884 the total number of new buildings was 28,020. The cost of the new buildings is in similar proportion. In 1882 the aggregate value of improvements in the cities named was $97,835,000. In 1883 the total was $102,450,000. In 1884 it was $102,868,000. From this general survey of the situation, notwithstanding that it lacks many details that our readers would be glad to see presented, it will be noticed that the building business has not yet suffered in proportion to other industries in the hard times that we are now experiencing. It is yet too early to prophesy for a new year, but all have reason to be satisfied with the present outlook, and all have cause to congratulate themselves that things are not nearly so bad as they might be.

NEW PUBLICATIONS.

INDIAN DOMESTIC ARCHITECTURE. By Lockwood De Forrest. One volume, 11 x 14 inches, boards, containing 25 full-page plates. Published by the author. Price, $10.

Some time since Mr. De Forrest visited India, and a number of the plates which appear in this volume are from photographs taken at that time under his personal supervision. They have been reproduced by the heliotype process, and are now for the first time made public. The object in publishing these examples of Indian architecture has been to bring to the attention of all who are interested in the general subject the industries of wood and stone carvings as they are applied to buildings in India. In the estimation of the author an art excellence exists in much of the Indian work typified by his illustrations that could be imitated advantageously both in this country and in Europe. Indeed, Mr. De Forrest has already established quite a business in the importation of work of this kind. At the time he was abroad he organized a factory in India for the production of this work, and is at present engaged in importing the product of his factory and using it in decorations in New York City and elsewhere. Concerning this the author says in his preface that his work, which has been going on for more than four years, is no longer an experiment, and that he can say with perfect confidence that better carving has never been made than what is being done at the present time. Among the plates presented in this volume are views of his rooms at No. 9 East Seventeenth street, New York. These views afford a practical example of the carvings described as applied to modern domestic architecture. It is scarcely possible to conceive a more beautiful adaptation of the exquisite details shown in the architecture of the East than is presented in these two views. The carving is rich and delicate in low relief, and there are also shown handsome designs in tracery. The whole combine to form a picture of decoration at once novel and at the same time adapted to the needs of the present day. The volume will be a revelation to all who have never before given attention to the styles and form of decoration in Indian architecture. The illustrations include a house of the sixteenth century, another of the seventeenth century, and a third of the eighteenth century, at Ahnedabad; a copy of one of the Bhudder windows, at Ahnedabad, made by Mr. DeForrest's men and sold to the South Kensington Museum; also a copy of the second Bhudder window, now in Mr. DeForrest's possession in New York. Other very interesting subjects are included.

THE BUILDER'S GUIDE AND POCKET COMPANION. By I. P. Hicks, architect, carpenter and builder. Size 4 x 5½ inches, paper covers, 80 pages, with illustrations. Published by the author. Price, 75 cents.

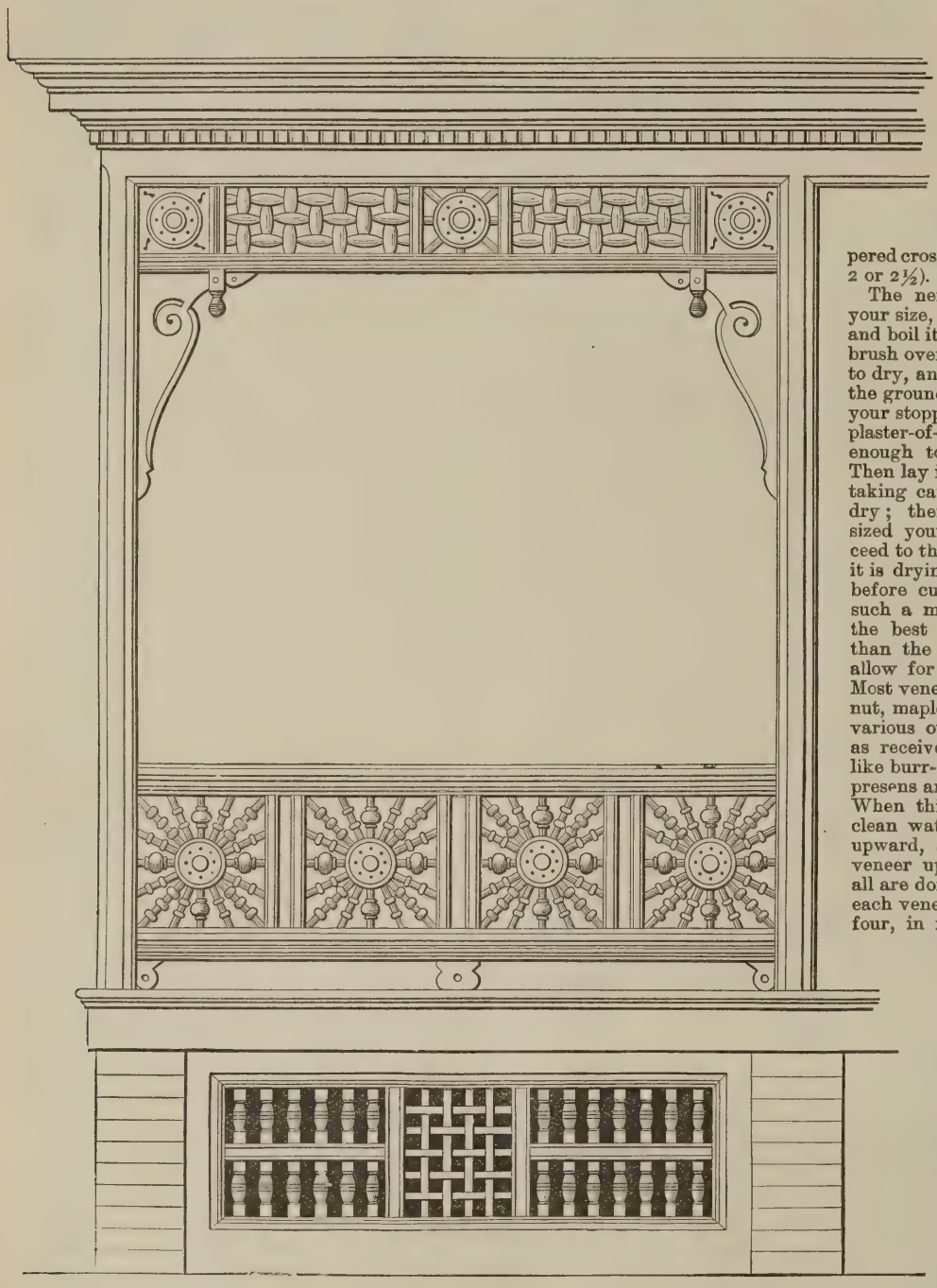
This little work, the author informs us in the introduction, embraces a large amount of valuable information regarding the trades of contractors, carpenters and builders. It has special reference to estimates, and is intended to be a guide in making out figures on contracts. In the effort to provide a definite system of estimating a list of items is given relating to different parts of the work. The general rule laid down for estimating for material is to begin with the list and go through the items in the order in which they are presented. Afterward look over the list and see if anything else is required, which, if found, add at the proper place. The book as a whole may be described as a collection of rules and recipes which the author has found useful in his own practice and which he has arranged in the form of a book for the benefit of other mechanics. There is not very much system about the arrangement, and it lacks digesting in various respects. Only one attempt is made at elevations or perspective, but of the cut thus produced two impressions are shown, one at each end of the book. The style of the engraving is beyond our ability to describe, but it very much resembles some of the efforts of school children when amusing themselves with their slates by drawing houses in which their dolls are supposed to live. The happy freedom from such restraint as scale and correct proportion of parts has given the artist an opportunity to display himself, which he has used to the utmost. With all truthfulness we can paraphrase General Grant's remark concerning Mark Twain's map of the Franco-Prussian war, "We never saw such a picture before."

Red Slate.

Almost all of the consumers of red slate rest under the impression that it is quarried principally in Vermont. This is an error. The only red slate in the world which it has been found practicable to quarry lies in the State of New York, although some of the quarries are so near to the Vermont line that shipments are frequently made from the latter State. From these facts the erroneous impression mentioned has arisen. As in all other colors of slate, the producers make two grades, bearing the usual distinction of No. 1 and No. 2. No. 1 is selected from the entire product, and consists only of the material which is smooth in texture, uniform in color, straight, and free from "knots." All the rest of the slate which lacks these qualities is called No. 2 or second. Independent of this classification there is another concerning the color, which implies the dark red, medium, and the light, or pink. The dark and medium colored slate is the best and strongest, and possesses that quality which roofing slaters always seek, called "metal," and roofing of this variety forms probably the handsomest covering which it is possible to obtain. The lightest, or pink, is apt to be brittle, and is not so strong, although some slaters prefer it because of the brighter hue. It is also apt to fade. For general purposes, such as strength, beauty of appearance and unfading quality, the medium bright red is deservedly the favorite. As stated above, it is found under producible circumstances only in New York, although veins have been discovered in other States, but they have not yet been found in sufficient quantities to be utilized.

Piazza Designs.

On pages 164 to 167, inclusive, we show two additional piazza designs by J. R. Church, of Rochester, N, Y. The elevations are accompanied by details drawn to a larger scale. The designs shown in this case are of a plainer character than some others of the series which have preceded them, and yet they have features about them which recommend them for favorable consideration. The center panel in the design on page 166 is in some respects the equivalent of the panels of the balustrade in the design shown on page 164, and therefore we have omitted a detail of it.



Piazza Design by J. R. Church, Rochester, N. Y.—Scale, ½ Inch to the Foot.

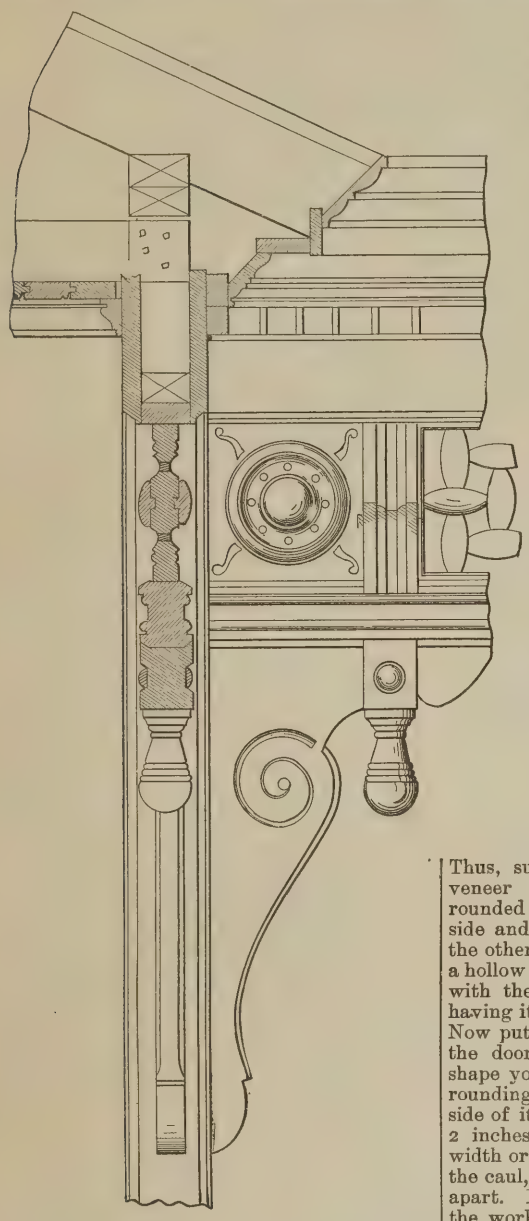
To preserve and improve the appearance of the wooden parts of tools, such as stocks or planes and handles of chisels, they should be soaked in linseed oil for a week, and then rubbed with a cloth for a few minutes every day for a week or so. This produces a beautiful surface and likewise solidifies the wood.

The Art of Veneering.

A wood suitable for veneering requires to be thoroughly well seasoned, free from knots and shakes, and should not contain turps. The best of woods for the purpose are mahogany and American walnut, although good pine answers well for ordinary purposes. The surface, if flat, is carefully planed up with the trying plane. It is then well toothed over with the toothing plane—first, the lengthways of the grain of the wood and afterward crossways—care being taken to tooth the work thoroughly. If you are working pine, use a coarse toothing iron; if mahogany or other hardwood, a finer iron is requisite. If the work presents a hollow or rounded surface, it is shaped with suitable planes, rasps and files, and finally well papered crossways with coase sandpaper (strong 2 or 2½).

The next operation is sizing. To make your size, take one part of good Scotch glue, and boil it well with 50 parts of water; then brush over the groundwork while hot; allow to dry, and if there should be any defects in the groundwork fill in with stopping. Make your stopping by mixing some finely-ground plaster-of-paris with hot glue and water, enough to form a moderately stiff paste. Then lay in where necessary with a chisel, taking care to allow for shrinkage; let it dry; then level off with a rasp. Having sized your groundwork over, you may proceed to the preparation of the veneer while it is drying. Look carefully at your wood before cutting it, and see that you do so in such a manner as to get the grain of it to the best advadtage. Cut it rather larger than the surface you intend to veneer, to allow for leveling at the ends and sides. Most veneers, such as mahogany, oak, chestnut, maple, sycamore, birch, satinwood and various other woods, are ready for cutting as received from the merchant, but some, like burr-walnut, brown oak, amboyna, &c., presens an uneven surface called "backly." When this is the case, damp one side with clean water, lay it down with its dry side upward, and put the wet side of the next veneer upon it, repeating the operation till all are done. Take particular care to keep each veneer, if you have more than three or four, in its proper order, as you damp and turn over, and do not on any account get them mixed. Let your wood stand about five or six hours, then spread out and allow to nearly dry, and they will be ready for cutting out. The next process is flatting. Get two pieces of wood (dry straight pine will answer well) rather larger than your veneer, and heat them on a stove or before a bright fire; then place the veneers between them, hand-screw together, and allow it to remain for about half an hour; then repeat this operation until the veneer is perfectly dry and thoroughly flat. Our wood is now ready for filling in. If it is perfectly sound this operation, is of course, unnecessary; but it frequently happens, especially with burr-walnut, that it contains holes that require filling. To do this take a piece of the veneer (off the edges of that already cut out) and flat it precisely as the other. Select the part of it which matches best with the grain of the wood around the hole required to be filled in. Place this piece underneath the hole. If you have a stump rather larger than the hole you may now cut it square or circular, and the piece for filling it at the same time. If not, take an ordinary pocket-knife having a sharp point, and cut your hole and veneer the required shape. When you have filled in your wood lay it on a flat board; then press your pieces in with a hammer. If

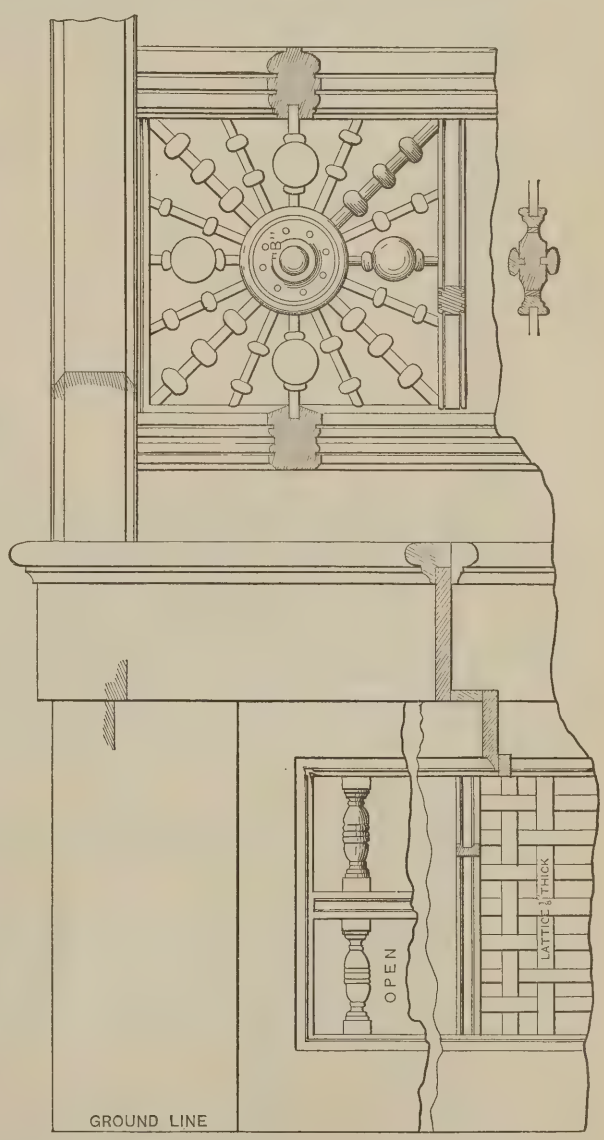
they are rather large you may use one or two fine-pointed tacks to keep them in position. Now cover all your pieces with strips of paper—select a strong paper for the purpose, one that is not too thick; copy-book or note paper answers well for the purpose. Glue it on one side, taking care to use the glue just thick enough to hold your wood in position.



Piazza Design—Details of Cornice, Post, Bracket, &c.—Scale, 1 Inch to the Foot.

Pay particular attention to this or it will cause you a good deal of trouble. You will find it best to cut the paper in strips about 1¼ inches or 1½ inches wide. Lay it on a board to glue and smooth it over your veneer with a damp rag.

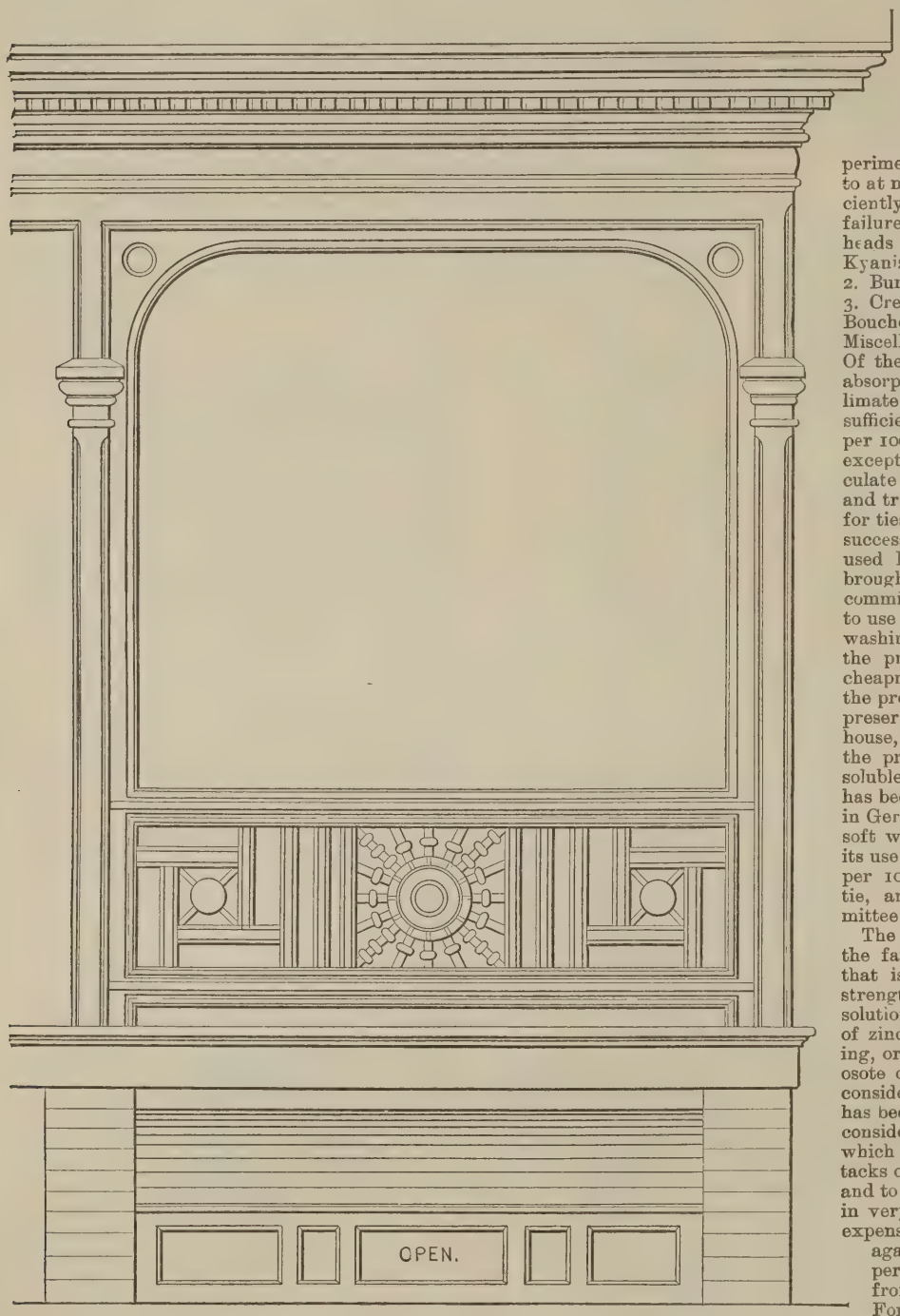
We now proceed to jointing. Place your veneer in the position it will appear in when laid. Observe that it matches. If you are to have one joint with two veneers, or two joints with four veneers, see that the grain of the wood forms a figure having both sides alike. If you have kept your veneers in their right or following order this will not be difficult. If you are working a thick veneer (saw-cut), make your joints with an iron plane or ordinary trying plane on the shooting board; if using a thin veneer (knife-cut), make them with a chisel and straight-edge. Take particular care to have the bevel edge of the chisel against the straight-edge when cutting, or it will run, and you may come off with an ugly cut. Now put the jointed edges together on a deal board. Tack one edge down; put the tacks about ¾ inch from the jointed edges and about 2½ inches apart. Having tacked one piece down, put the other up to it and tack in the same manner. Now cover all the joints with paper, glue in the same manner as previously mentioned for the filling-in, smooth it well down with a damp rag and allow to dry. If the weather is hot, it is best to cover your joints, to prevent them drying too quickly. A good and simple method is to lay your board with the veneer downward on the floor. Let the joints dry, then take out the tacks and knock the tack holes up with the hammer from the underneath side. Put the veneer aside until you are ready for laying it. It is best to cover it up and keep the air from it by placing it under a board or wrapper. There are two ways of laying veneer, by means of a caul or a veneering hammer. We shall describe both methods, although the first is of greater importance, and should, wherever practicable, be adopted; but in certain cases which we shall mention the second is extremely useful. In the first place, to make a caul, take a well-seasoned piece of cedar or pine, rather larger than the surface you intend to veneer (about 1 inch or 1½ inches each way) and plane it up true on both sides if the work is flat; if otherwise, make it the requsite shape to fit the work—hollow, round or whatever it may be. If you have to shape your caul you should use thicker stuff, and it is advisable to screw two or three battens on the back. When making shaped cauls it is best at the same time to get out the pieces of wood necessary to form a flat surface when the work is put in the caul. Thus, suppose we want to veneer a door having a rounded surface on one side and a hollow one on the other. We have made a hollow caul to correspond with the rounded surface, having its under side flat. Now put the round side of the door in the caul and shape your pieces of wood, rounding to fit the hollow side of it. They should be 2 inches wide, the same width or a little wider than the caul, and 5 or 6 inches apart. If one side only of the work is shaped these woods are unnecessary. If your wood is not wide enough, make a good joint, dowel it together, and only glue the dowels into one side, so that you can take it to pieces for heating. The caul, if likely to be much in use, should be covered with zinc; cut the metal out large enough to cover the face of it with sufficient to turn over the edges and ends, and fasten it on with flat-headed zinc or copper nails. Numerous failures in unaccustomed hands may be ascribed to the use of bad glue. Nothing but the very best glue should ever be used for veneering. Get the best Scotch glue you can obtain, break it up and boil thoroughly. It differs so much in strength that the proportion of water suitable for it can scarcely be given; but after breaking up in pieces just cover with water and allow it to soak; then boil off with frequent stirring. It will, if good, now require about half as much water as previously added to bring it to the right consistency for veneering. It should spread evenly under the brush, and be free from lumps. Having made the caul and prepared the glue, get the hand-screws and cramps ready and commence laying. Heat the caul on a stove or before a bright fire. If it is doweled together, and if it is more convenient, take it to pieces, taking care to mark your joints first. If you intend laying two similar pieces of veneer on flat surfaces, heat both sides of it and do both of them together. If not, get one side of it well heated as hot as you can without letting it burn; while it is heating set the hand-screws and cramps open as near the distance as you will require them, and place handy to your work. Now glue your groundwork well, and, if your veneer shows any inclination to be backly, glue it slightly on the underneath side, as this will help to soften it (remember the jointing paper on the veneer is laid on the outside). Having finished gluing, put the veneer on the work, and smooth it gently over with the hand. Then see that the caul is hot enough, and its surface free from any small cinders or dirt; now rub it over with a greasy rag and lay it gently on your veneer. Draw your work and caul a little over the front or end of the bench, just enough to get the hand-screw on; put it on very gently; then tighten as much as possible. You can then stand it upon the floor, and, if you have not any one to hold it for you, rest the hand-screw against your bench while you put on the remainder. They should be placed about 6 inches apart, and mind they bite fairly. Do not get one screw tighter than the other, or you will only get the pressure at the outside or inside of the chaps. If you have a piece of work so wide that the screws will not well reach its center from either the sides or the ends, get two pieces of wood 2 or 2½ inches thick, and about the same width as thickness; plane them up, slightly rounding on



Details of Balustrade and Base.—Scale, 1 Inch to the Foot.

one side; put their rounding sides facing each other, on the work, and hand-screw them at each end; they will then tighten in the middle and give sufficient pressure. Let your caul remain on for an hour—in very hot weather longer will not hurt; then undo the hand-screws, and, if the caul sticks, insert the edge of a thin metal square, the back of a handsaw, or anything of a similar nature, between it and the veneer, and work it carefully about till you get them apart. If you have used the glue thick enough and greased the caul well, you will not have much trouble, and they will often come apart themselves, or, by giving the end of the caul a tap with a hammer or on the bench. See that the veneer is down. Feel it all over with your hand. If it is up you will be able to tell by the hollow sound on tapping it with the tip of your finger, as well as by the raised appearance termed "blisters" it will present when held in the light. If you heat your caul sufficiently, use your glue thick enough, and put the hand-screws on properly, you will not be troubled with blisters. Should there, however, be any, let the work stand about one or two hours, and then put a smaller hot caul on where required until well down all over.

To level the veneer, first lay it (veneer side downward) on a board and scrape off with a chisel as much of the glue that has come over the edges as you can. Now put it in the bench-screw, and level toward you with paring chisel if thin veneer—if thick, use a smoothing plane. Put it aside to dry. If you have two pieces the same size, put them with their veneered sides together; if only one, place it so that the air does not get at the veneer. Allow to stand two or three days, then scrape off with a chisel the paper used for filling in pieces and jointing, having previously dampened it with hot water. The work is now ready for sizing; this operation may be dispensed with, but it is decidedly advantageous, especially if you are working wood having an open grain. The size, which should be about the same strength as that used for the groundwork, is brushed or rubbed over the veneer with the hand, then wiped off as dry as possible with a cloth. As I have already mentioned, this method of veneering is useful in certain cases. We sometimes want to veneer an edge, or put a narrow slip of veneer on some small surface, where it would be inconvenient to caul it down. If we are working a wood of glossy or greasy description (like satinwood or rosewood), its nature will not admit of sufficient pressure by this process, nor should it ever be adopted for work where water will act injuriously. We believe the prevailing opinion is that veneer requires a good deal of water to make it lie. In the first process, you will remember that it is laid quite dry. In the second process water is used; and if we consider that a damp surface tends to cause the wood to cast as it dries, we can readily understand where it should be used.



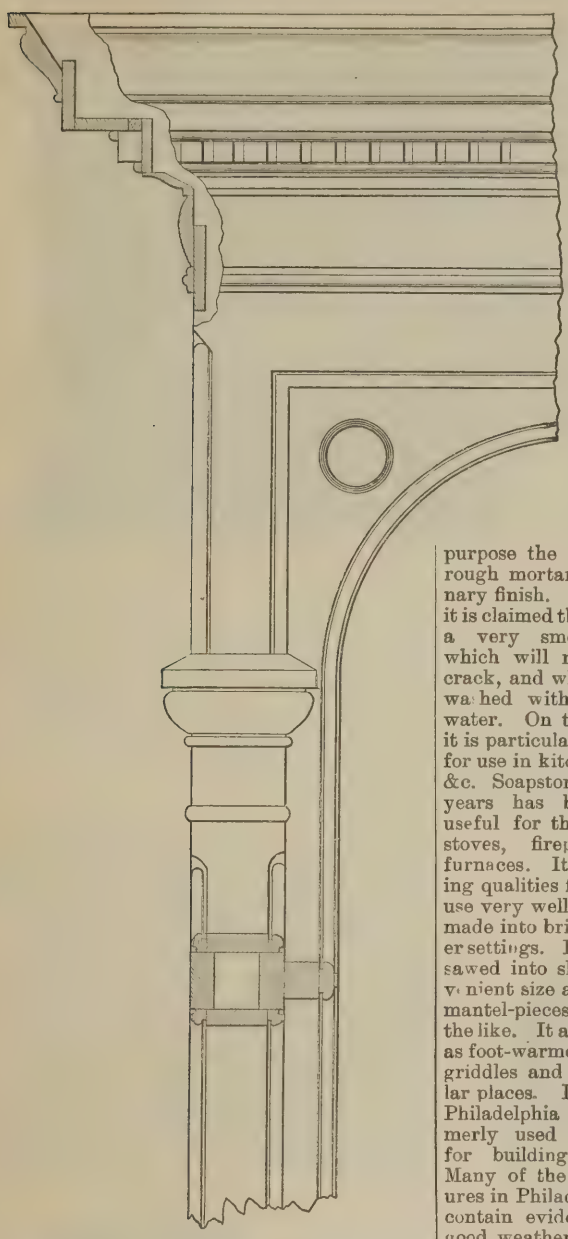
Piazza Design by J. R. Church, Rochester, N. Y.—Scale, ½ Inch to the Foot.

Preserving Processes for Timber.

Mr. John Bogart, secretary of the American Society of Civil Engineers, for the convenience of members who desired to discuss the report of a special committee on the preservation of timber, at the recent annual convention, printed the following brief summary of its contents: The experience in the United States is given in five tables, comprising the results more or less conclusive of 142 authenticated trials or experiments. In each case these are referred to at more or less length in the text, sufficiently to give the reasons for success or failure, and the lesson taught. The five heads corresponding to the tables are: 1. Kyanizing, or use of corrosive sublimate. 2. Burnetizing, or use of chloride of zinc. 3. Creosoting, or use of creosote oil. 4. Boucherie, or use of sulphate of copper. 5. Miscellaneous, or use of various substances. Of the first, kyanizing, it is stated that an absorption of 4 or 5 pounds of corrosive sublimate per 1000 feet, b. m., is considered sufficient, and it would now cost about $6 per 1000 feet, b. m. It is not recommended except in situations where the air can circulate freely about the wood, as in bridges and trestles, but in very damp locations (as for ties when in wet soil and pavements) its success is doubtful. Its cost when first used led to cheating, which for a time brought discredit upon it. Burnetizing the committee do not consider the best adapted to use where the timber is exposed to the washing action of water (as this removes the preservative); but, on account of its cheapness, it is probably to be preferred at the present time to any other process for the preservation of railroad ties. The Wellhouse, Thilmany and other modifications of the process aim at making the chloride insoluble, but are yet on trial. This process has been largely and successfully introduced in Germany. Experience shows the life of soft wood ties to be doubled and trebled by its use. Its cost in this country is about $5 per 1000 feet, b. m., or 20 to 25 cents per tie, and for the latter purpose the committee particularly recommend it.

The work must be well done; but some of the failures were from doing it too well—that is, from using solutions of too great strength, thus making the timber brittle. A solution of 2 per cent. by weight of chloride of zinc in water is recommended. Creosoting, or the injection of timber with hot creosote oil in a cylinder under pressure, is considered to be the very best process which has been fully tested where expense is not considered. It is as yet the only one known which is sure to prevent the destructive attacks of the teredo or other marine animals, and to give absolute protection against decay in very wet situations. It is a somewhat expensive process, requiring for protection against the teredo from 10 to 20 pounds per cubic foot of timber, and costing from $12 to $20 per 1000 feet, b. m. For resisting decay alone a cost of $10 to $14 is sufficient. The boucherie process, in which green timber is impregnated with sulphate of copper either by vital suction, hydraulic pressure or a vacuum, when well done, using a solution of 1 pound of sulphate to 100 of water, has proved fairly successful. Under the head of "miscellaneous" are classed 41 experiments with almost as many substances—sulphate and pyrolignite of iron, lime, rosin oil, tar, &c.—but with as yet no commercial success. The general principles laid down are to select the process with reference to the subsequent exposure. Use open-grained porous timber—for that reason, in general the cheaper woods. Extract the sap and water to make room for

the material to be injected, natural seasoning, except for the boucherie process, being very desirable. Steaming takes the place of seasoning. Use enough of the antiseptic to insure a good result, and then let the timber dry before using, as its durability will thus be increased. Do not hasten the work if it is to be well done. Protect ties or timber in the track as far as may be from water by drainage. Contract only with reliable parties of established reputation, under a skilled inspector, who must be in constant attendance when the magnitude of the order warrants. There is at the close a discussion of the question, Will any preserving process pay? This is answered in the affirmative. The chairman of the committee gives a careful estimate in one of the appendices in an actual case in this country; another general estimate is given based on European experience, and three other separate appendices give different methods of examining the question of economy and comparing values. Other appendices (to the number of 20 in all) treat of the general question of destruction and conservation of forests, and give reports of the personal experience of a number of engineers, with methods pursued, apparatus used, &c.

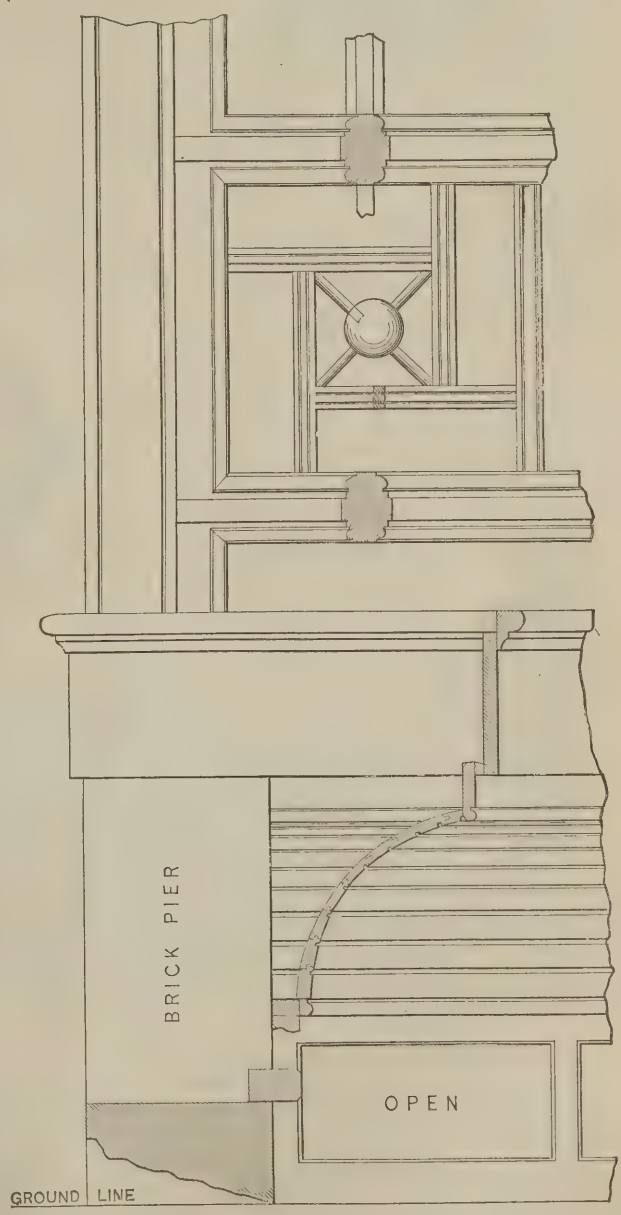


Piazza Design.—Detail of Post and Cornice. —Scale, 1 Inch to the Foot.

At Haverstraw, on the Hudson, 50 firms engaged in the manufacture of brick employ 3000 men and turn out 302,500,000 brick annually.

Soapstone.

The rock usually called by this name is very greasy to the feel, and to this property it owes its name. Quite a number of uses have been found for it. Certain varieties in Saxony, Bavaria and Hungary are said to be serviceable in the manufacture of porcelain. It is said to impart to the biscuit a desirable degree of translucency. In the form of powder it is used for polishing the softer varieties of stones for decorative uses. It is also used for polishing mirror glass. In the form of powder it has lately come into use for foundry facings, for the production of smooth-faced castings. It is also used in a powdered form as an ingredient of various lubricating preparations. It is likewise used in the manufacture of mineral paints and in the composition of crayons. Another use for powdered soapstone is as a substitute for bands as a finish for walls and ceilings. For this purpose the soapstone dust is applied to the rough mortar surface the same as an ordinary finish. The cost is about the same, and it is claimed that it makes a very smooth wall, which will not chip or crack, and which can be washed with soap and water. On this account it is particularly adapted for use in kitchens, halls, &c. Soapstone for many years has been found useful for the linings of stoves, fireplaces and furnaces. Its fire-resisting qualities fit it to this use very well. It is also made into bricks for boiler settings. It is likewise sawed into slabs of convenient size and used for mantel-pieces, sinks and the like. It also finds use as foot-warmers, for cake griddles and other similar places. In and about Philadelphia it was formerly used extensively for building purposes. Many of the old structures in Philadelphia still contain evidences of its good weathering properties. The sills of the windows and other portions of the old Independence Hall, in that city, are made of it, and, though exposed to the weather for over a century, exhibit little, if any, signs of wear. The coping of several of the old walls surrounding the Quaker meeting-houses and burying grounds in the same city are also of soapstone, and exhibit a remarkable state of preservation. Extensive deposits of soapstone occur in the neighborhood of Dalton, Mass., where it is quarried in large quantities, in blocks and slabs of various sizes, by the Wahconah Soapstone Company. By this company it is supplied for most of the uses which we have enumerated. This company mention, among other products in this line, soapstone sinks, soapstone foot-warmers, soapstone griddles, soapstone register frames and soapstone blocks and slabs of various sizes for different uses. The refuse pieces are ground into dust, and in this form the soapstone is supplied for the various purposes to which the dust is applicable, some of which we have described. The business offices of the Wahconah Soapstone Company are located at Pittsfield, Mass.



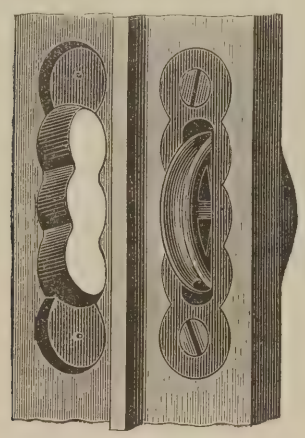
Details of Balustrade and Base.—Scale, 1 Inch to the Foot.

Some years since the managers of the St. Louis Mutual Life Insurance Company erected an expensive six-story building in that city, and adorned (?) the top of its walls above the cornice with a row of gigantic stone statues of various mythological celebrities, none of which, we venture to say, were ever before known to have had any connection with life insurance. These alleged works of art are said to have cost between $15,000 and $20,000. From the time they were put in place they became a gazing stock to the few people who occasionally got far enough away to see them. To the vast majority of people, however, who daily passed and repassed the costly building, this art gallery was as completely out of sight as if the statues had been buried in the cellar. Since then the company has failed. Its supposed beneficiaries have lost all their savings, and the building has passed into other hands. As a result the gigantic statues have all been sent down to *terra firma*, and carted off to make room for the addition of two or three more stories for the use of present tenants, who are the Missouri Pacific and Wabash Railroad companies. Our correspondent who furnishes us the above information states that there is now somewhere in St. Louis a stock of stone statues of heroic size which doubtless could be purchased very cheaply.

NOVELTIES.

New Sash Pulley.

The Palmer Mfg. Co., of Troy, N. Y., are putting upon the market a new article in the way of sash pulleys, which is known as Palmer's Common Sense Pulley, engravings of which are presented in Figs. 1 and 2 of the illustrations. The face of this pulley, instead of being square, like those commonly used, is made to fit a series of holes such as would be made with a common auger bit. The three center ones are bored through the window jamb, while the two end ones are made only deep enough to lay the face in flush with the surface of the jamb. When the holes are bored as described the mortise



Novelties—Fig. 1.—Palmer's Common Sense Sash Pulley.

is entirely clean, and nothing remains but to drop the pulley in its place and put the screws in the holes which have already been made by the center of the bit used in boring the mortise. In Fig. 2 we show one of the pulleys complete, while in Fig. 1 a mortise hole ready to receive the pulley is shown. At the right a pulley is shown in place in the frame. Based on the average of actual tests made under their directions, the makers claim that ten of these pulleys can be applied to one of the ordinary square-face variety. They claim, further, that a better and handsomer frame is produced by its use than with any other pulley in the market; also that as many, if not more, of these pulleys can be applied in a given time with a boring machine such as is to be found in every wood-working establishment as can be applied of the common kind with any special machine made for such work alone. One of the leading features of this device is its adaptability to the facilities of all users of pulleys. The adoption of this pulley is not attended by any outlay whatever in the way of preparation. The only special tool required is a die for marking the centers of the five holes to be bored for putting the pulley in place, and such a tool is furnished gratis by the manufacturers.

Fig. 2—The Pulley Detached.

The Johnson Fire-Escape.

We suppose if all houses, including hotels and public buildings, were built, not necessarily fire-proof, but in such a manner as to present less danger of burning than at present, the opportunity of fire-escape manufacturers to build up a profitable business would be less advantageous than it is. With the present fashion in building, however, there are very few structures in which it is safe to be without some other available mode of escape in case of a fire than the stairs and elevators that are usually provided. Travelers of late carry in their trunks various forms of portable fire-escapes with which to make their way out of hotels in the night on the occasion of fire, without depending upon staircases. Office buildings in the large cities are more or less equipped with similar apparatus in addition to outside balconies and ladders, and many dwellings are likewise provided with portable fire-escapes for the security of their inmates. There are a great many devices of this general kind on the market. Fig. 3 of our engravings represents the Johnson Automatic Fire-Escape, manufactured by the Warren Fire Escape Company, Warren, Ohio, which is made in two forms, portable and stationary. The engraving shows the portable form, and is about one-quarter actual size. The method of use is suggested by the engraving. The apparatus consists of a shell within which is wound a light wire cable. The free end of the cable terminates in a gimlet screw made of steel, and so arranged as to be fastened in place securely on very short notice. The strap or belt below the device is fastened under the arms, and the person in danger of burning then jumps from the window. A feature of construction is a governor which is automatic in character. With either light or heavy weight there is no difference in speed, the latter being established at the rate of 250 feet per minute. A winding pivot is provided, so that after it has been

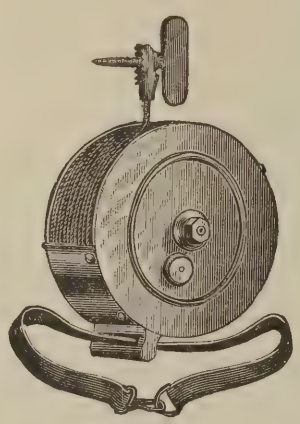


Fig. 3.—The Johnson Portable Fire-Escape.

used it is readily rewound, so as to be again in shape. In case it is impossible to save the cable for rewinding, as would sometimes be the case, the cable can be readily severed near the instrument, under which circumstances the manufacturers supply a new cable, thus restoring it to its original shape. The case is made of sheet steel, the reel on which the cable winds is of malleable iron and phosphor-bronze, while the cable itself is composed of 42 strands of steel wire. Three sizes are manufactured, No. 1 having a cable 60 feet in length and No. 2 a cable of 80 feet, weighing respectively 3¾ and 4½ pounds, while No. 3 has a cable 100 feet long.

Asylum Registers.

The Tuttle & Bailey Mfg. Co., of 83 Beekman street, New York, are putting on the market Tobey's Patent Asylum Registers, the general features of which are indicated in Fig. 4 of the engravings. This register has been specially devised to meet the requirements of insane asylums, strong-rooms in jails and other similar positions. It is the invention of Dr. H. A. Tobey, the superintendent of the Asylum for the Insane located at Dayton, Ohio. The grating is hinged at the bottom and is fastened at the top by a Yale lock, which not only renders it secure, but also makes it convenient to open, as shown in the cut, whenever desired. By an upright curve in the lower part of the register, and by the overlapping fans or valves, as shown in the cut, it is made impossible to

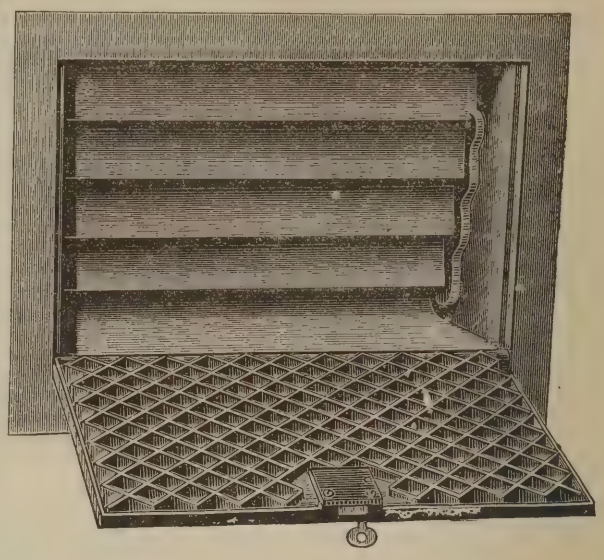


Fig. 4.—Tobey's Lock Register for Asylums and Jails.

throw any liquid or other substance through the front plate so as to reach the flue. This is an important consideration in goods of this character, and will be appreciated by all who have occasion to use the same. Four sizes are manufactured, namely, 8 x 10, 8 x 12, 10 x 12 and 10 x 14.

Prouty's Rigid Door Knob.

In Fig. 5 is shown Prouty's Rigid Door Knob, of which the New England Butt Company, Providence, R. I., are the sole manufacturers. This knob is a new article, and operates in an entirely different manner from the ordinary door knob. Instead of turning the handle, as is usually done, to release the latch bolt, the door is opened by pressing a button in the center of the knob head. This button, or center piece, so called, ends in a square shank, as is shown in the cut, which presses against one end of a little curved arm of cast iron, which in turn acts upon an attachment at the inner end of the latch bolt in such a manner as to force the bolt back. Such is a general description of the method of operation, though probably a more exact idea may be gathered from a careful inspection of the sectional view. One of the principal features of this door knob is the way in which the several parts are fastened together, and to the door, no screw or bolt of any kind being visible on

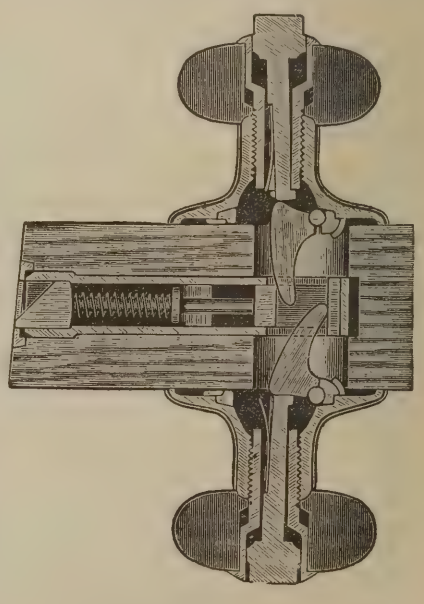
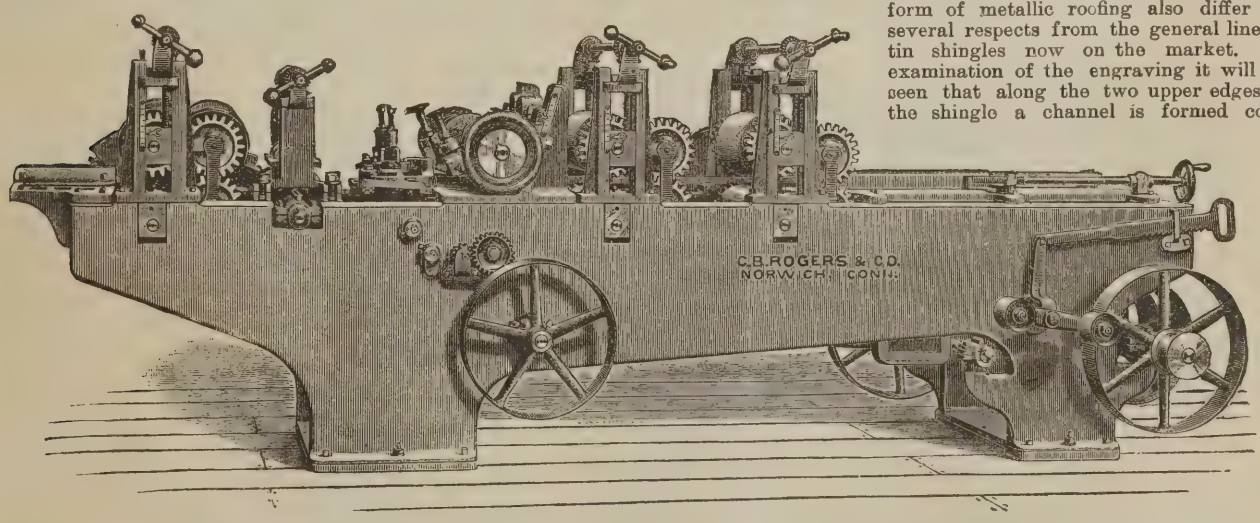


Fig. 5.—Prouty's Rigid Door Knob.

the outside. After the hole is bored through the door the knobs are fastened on by long screw bolts which pass through the door and fasten both of the cast-iron knobs firmly to the wood. Over these are placed the shells of finished metal, and the knob head of porcelain or other material placed on top. Through the knob head and into the cast-iron base is screwed a metal sleeve flanged outward at the top, which holds all the parts rigidly together. Inside of this sleeve or hollow screw is the center-piece before mentioned, which is held in position by a spring at one end. The outer end of the center-piece is marked on the same side as the spring. To take the knob apart the center-piece is pressed sideways against the mark; by so doing the spring is flattened and the shoulder raised, thus permitting the withdrawal of the piece. The metal sleeve is unscrewed by a screw driver or an L-shaped wrench which fits into the square hole. The other parts are removed by loosening the two screws before mentioned. It will be seen from the cut that these door knobs require a special lock or latch, of which the New England Butt Company are also the sole manufacturers. The knobs, of which there are several different styles, are made of bronze, porcelain, jet and hemacite. Among the advantages claimed for these knobs are the secure manner in which the knob heads are fastened, making it impossible to loosen them or pull them off; the ease with which doors may be opened when one's hands are occupied; their adaptability to doors of different thickness, and the firm method of fastening them, which prevents any loosening or displacement of the parts.

Fast-Feed Flooring Machine.

The Flooring Machine illustrated in Fig. 6, the makers, Messrs. C. B. Rogers & Co., Norwich, Conn., inform us, while new in design, embraces all of the best features of their older patterns. At the same time it embodies several new ideas which have been suggested by their long experience. The machine will double-surface 14 inches wide and up to 4 inches thick, and matches out 10 inches wide. The frame is heavy and is as plain as possible. All the working parts are placed inside, although all of the adjustments are easily accessible. The number of parts has been reduced to the lowest possible figure, and each part has been made heavy and is thoroughly protected to avoid breakage. The cylinders are both made from solid-steel forgings, and are slotted on four sides; the bearings are large, the boxes are self-oiling, and are connected in yoke form to avoid the possibility of cramping. Ordinarily the common style of side heads are furnished with this machine, although other kinds are supplied on order. The makers state, further, that the feed is exceptionally strong and that the rolls are of good size. The latter are geared at both ends, thus obviating the trouble so often experienced in single-geared machines, where the action of the gears has a tendency to exert an unequal pressure on the width of the board. In such machines, in running narrow stuff of varying thickness the uneven lifting of the rolls frequently results in cramping the gears and springing the roll-shafts. All this is avoided in this machine by the power being applied at both ends, so that an even pressure is obtained on the entire width of the stuff, making cramping an impossibility. Different feed pulleys are furnished with the machine, allowing of a wide range of speed, suited to all the various styles of work to which the machine is adapted, the fastest for flooring being 96 feet per minute. The chip breakers and pressures are adjustable for working moldings. The pressure over the lower cylinder is so arranged that it can be disengaged on the front side and swung up clear of the bed for easy access to the knives. The chip breakers for the top and side heads swing in the circle with the cut of the knives.



Novelties.—Fig. 6.—Fast-Feed Flooring Machine, Built by C. B. Rogers & Co., Norwich, Conn.

New Tin Shingle.

In Fig. 7 we show a new form of Tin Shingle which is being put upon the market by Geo. E. Cooper & Co., Nashville, Tenn. The inventor is Millard F. Hamsley, one of the members of the firm above mentioned. The engraving shows a number of plates composing a roof as they would appear when joined. It will be noticed that the shingles differ somewhat in general shape from other forms which have preceded them. They are square and are placed upon the roof diagonally, and are stamped to such a pattern as to form a somewhat intricate geometrical figure. The features of construction embodied in this form of metallic roofing also differ in several respects from the general line of tin shingles now on the market. By examination of the engraving it will be seen that along the two upper edges of the shingle a channel is formed constituting a nailing flange. The overlapping shingles cover not only this channel, but also the curved pointed ribs which extend outward and downward from the side of the channel. By this construction space for the nailing is obtained, and such a shape is secured as, it is claimed by the makers, successfully prevents the rain from driving between overlapping plates. It will also be noticed that the plates are

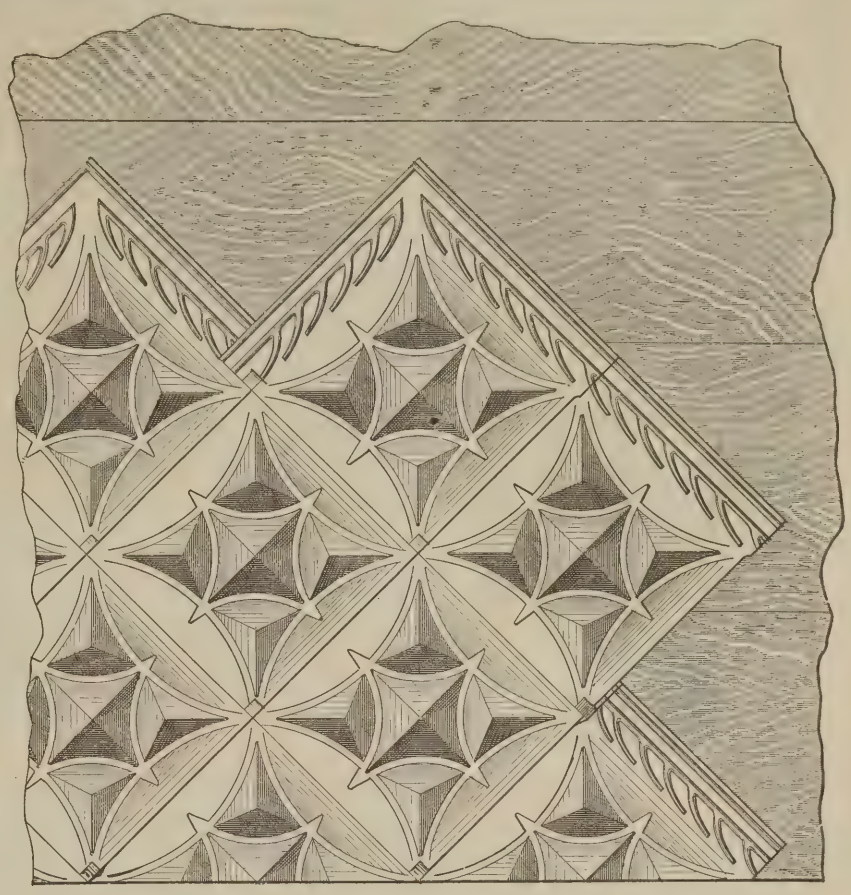
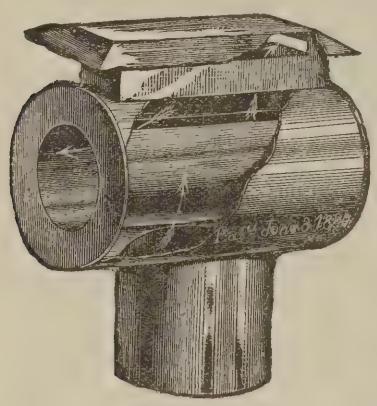


Fig. 7.—Hamsley's Tin Shingle.

slightly notched at two corners. The object of this is to facilitate the joining on the roof and to secure a fastening for the lower corner of each plate. How this is done will be readily understood by an examination of the engraving. The cuts are on adjacent edges of the shingle, and the resulting flanges are bent in opposite directions, and are so shaped as to fit together somewhat like hooking or dovetailing. By these general features of construction it will be seen that the plate is fastened on all sides, and yet in such a manner as to provide for contraction and expansion caused by changes of temperature. These plates, among other advantages to which the makers direct attention, are readily applied by those who are not skilled in roofing.

Chimney Cap.

Henry S. Dickinson, of No. 713 Grand street, Jersey City, is offering a Chimney Cap, the general features of which are indicated in Fig



Novelties.—Fig. 8.—Dickinson's Chimney Cap.

8. In its present form this cap is an improvement upon one which was patented by Mr. Dickinson some time since, and which he formerly manufactured. The object of the inventor in both cases has been to prevent back drafts in heavy winds, and to secure a certain and unobstructed draft at all times. An upright pipe which terminates the flue has placed upon its upper end a double cylinder, open at each end, and having an aperature at the top through both shells. The opening in the upper shell is protected by a hood. The smoke in passing from the flue divides and moves up either side of the central shell of the double cylinder, and may reach the outer atmosphere by continuing upward and out of the hood, or by passing down through the opening in the inside shell and thence outward through the end of the cylinder. The inventor states that when the wind drives into the tube at either end, having a clear course through the tube and out at the opposite end, the suction so caused draws the smoke after it, and at such times it passes outward through the opening provided in the inside cylinder, as shown. When there is no wind blowing, however, the course of the smoke is upward and out through the openings provided underneath the top cap.

Flexible Metal Fillet.

The H. B. Smith Machine Company, 925 Market street, Philadelphia, are putting upon the market a Flexible Metallic Fillet, which, although primarily intended for the use of pattern-makers, founders and machinists, proves to be of advantage as well to architects, carpenters, car-builders and other wood-workers. Several sizes of the fillet are manufactured, varying from ¼ inch up to ¾ inch in width. The face of the fillet is concave, while the back is square, thus adapting it to fit into the angle between two surfaces. It is suitable for use in either curved or straight moldings and wherever filleting is required that is exposed to the action of the weather, as well as for inside work. The circular of the company, among other applications, directs attention to its usefulness in places where other means would fail to make woodwork vermin-tight. The fillet is put up in reels of 100 feet each, and is fastened in place by shellac and bradding. After the fillet has been cut to length in the miter-box and placed in position, a hardwood stick, shaped at the end to fit the concave of the fillet, is used to rub it into position accurately before bradding. Gen. M. C. Meigs, the superintending engineer and architect of the new Pension Building, Washington, D. C., has used this material to cover the weather joints of the window frames of the new Pension Building. In a letter addressed to the company he says it takes the place of a wooden molding, and answers a very satisfactory purpose as a protection against rain. In the application of this article in this case putty has been used in some places in which to bed the fillet. Mr. E. D. Clark, architect of the United States Capitol Building, also uses it for glazing and for other similar purposes about the structure in his charge.

Self-Locking Blind Adjuster.

Fig. 9 illustrates Washburn's Improved Self-Locking Blind Adjuster, manufactured by D. B. Washburn, 151 Congress street, Boston, Mass. The special features to which the maker directs attention are that there is no cutting of the blind or sill, and that the same fixture is adapted to all kinds of blinds. The general features of this device are clearly shown in the engraving. The bracket attached to the blind is of such a form as to bind the bottom rail and stile together, so that the application of the fixture greatly strengthens the blind where the principal strain comes. To this bracket a rod is attached in such a manner as to be held level with the bottom rail of the blind, thus preventing the possibility of its becoming bent or broken between the blind and sill when accidentally loose. The hook on the end of the rod springs into the holes of the fixture on the sill in such a way as to hold the blind securely and at the same time noiselessly. The relationship of the pin which secures the rod to the fixture fastened to the window to the pin of the hinge is such that the rod permits of two adjustments of the blind when engaging in the same hole in the fixture on the sill. The blind partially opened in the engraving is shown held by the rod engaging in the middle hole in the sill fixture. As the blind is closed the rod is engaged in the hole nearest the hinge, as shown in that view of the blind shown at the right. On the other hand, when the blind is wide open—that is, swung clear back—the rod would engage in the supplementary fixture shown between the end of the rod in the cut and the blind hinge. When in this position the blind is firmly fastened back in such a way as not to be liable to be torn off by a high wind. When the blind is closed, as shown at the right in the cut, it is doubly secured, first by the usual catch and also by the hook of the adjuster.

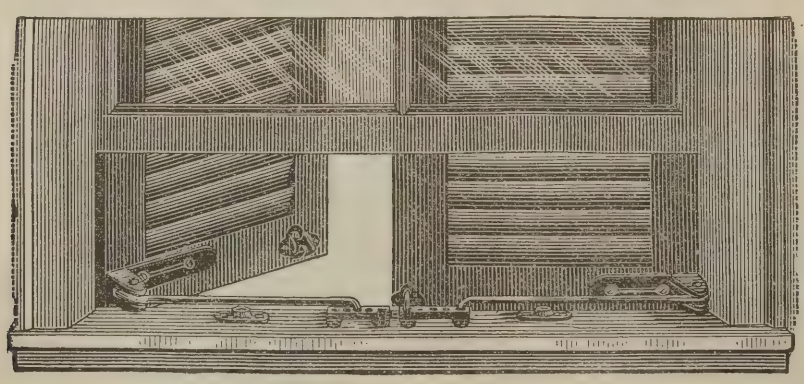


Fig. 9.—Washburn's Self-Locking Blind Adjuster.

Staining Wood.

On staining wood a writer in an exchange gives the following directions:

A good mahogany color can be had by dissolving maroon lake in water, adding a piece of potash about as large as a walnut to a quart of water, plenty of the color. This will give a good mahogany imitation on any wood and can be used to darken the mahogany if so desired. Oak or ash may be stained brown by using linseed oil and benzine half and half, and burnt umber or Vandyke brown incorporated with this. Maple can be stained green-gray by using copperas in water, oak will also be changed to a dark-green blue through the same agency, the effect on ash being various shades of olive green. Ammonia applied to oak produces the bronze olive tint now used so much by architects. Staining by the fumes of ammonia results in all shades from light olive to the rich deep brown of extreme age. This method is considered the best for imparting to oak or mahogany the appearance of age; and for those wishing to avail themselves of an easy, clean and certain means of gaining the result, fumigating offers no serious obstacle to its accomplishment, the articles necessary being easy of acquirement and at small expense.

Procure for your use a box sufficiently large to receive the article; any well-made packing-box will be suitable providing the joints or seams are close. Next get some strong full-strength liquid ammonia, not the diluted article of the druggist, pour some in a shallow receptacle—such, for instance, as a deep plate; place this in the bottom of the box, so that the fumes will rise and surround the object to be stained; close the box securely, so that the fumes will be confined as much as possible. When the article is small, of course, the box need not be large—the smaller the better, for then you will not require so much ammonia. You can see how the staining progresses by wetting a portion from time to time; otherwise the change of color would not be perceptible. All that is now necessary is to leave the ammonia to do the work, remembering that the longer the exposure the darker the hue will be.

Electric lights, unlike gas jets, may be projected downward at right angles with the wall or in any other position. When hung downward a peculiar shape of the globe somewhat like a vase is a graceful appendage. A light arranged in this manner and suspended by a curved rod resembles a flower. This principle is carried out in many of the fixtures which are now supplied. An examination of the showroom of a manufacturer of electric apparatus, or the sample-room of a dealer in such fixtures, reveals many handsome combinations both in form and color of fixtures of this kind. There are to be found beautiful designs of leafy drooping branches, with glass blossoms inclosing electric lamps. Other effects may be likened to chandeliers of crystals ornamented with jeweled glass. Whenever the lights are lit, using the conventional expression, there is revealed a wealth of color, with shimmers of blue, orange, carmine, yellow and many indescribable tints reflected from brass and other metal work. A handsome fixture of this general class for decorative purposes is a center piece for a ceiling. It may be described as a large semi-globe of opaque substance studded with jeweled glass. This is placed over a cluster of electric lamps. A fixture of this kind in a room provided with a looking-glass frieze that reflects the glow produces an effect that can scarcely be described.

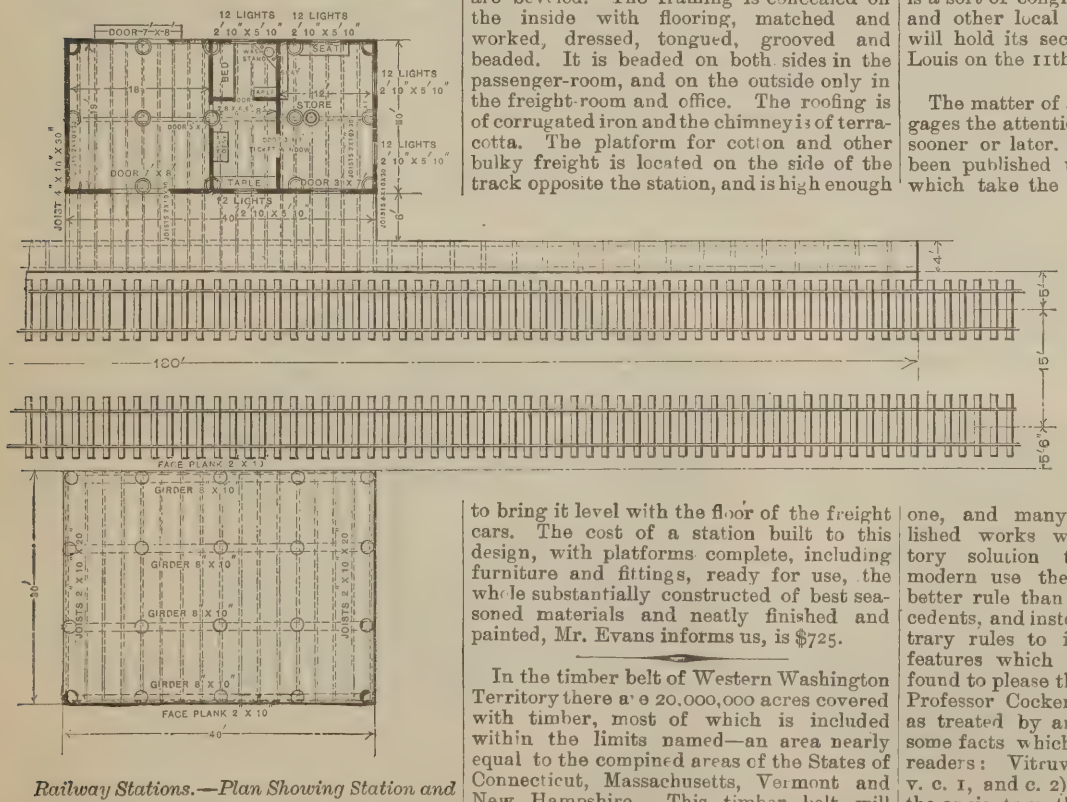
Polishing Woodwork.

Finishing woodwork by polishing is a distinct trade, and yet the manipulations are so simple that almost any one can practice them advantageously by the exercise of a little care and intelligent forethought. It is generally known that in this work shellac or varnish should be used, but how applied and how made is the question to be answered. Mr. James Thomson, in writing for one of our exchanges, presents some directions that are of interest. His directions apply to some simple household article, as, for example, a spinning wheel. He says:

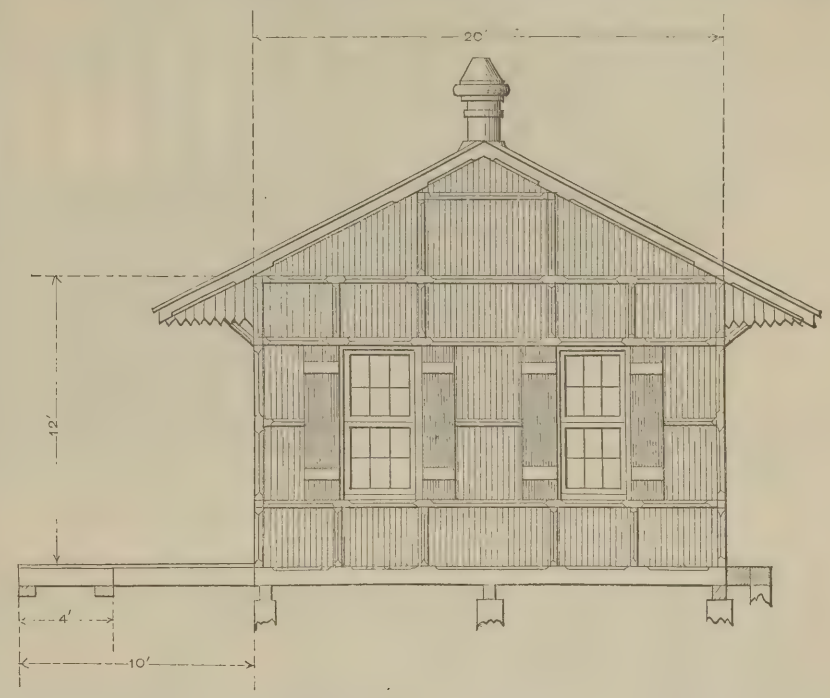
Apply one coat of shellac evenly with a brush; let stand until dry, which will be in about five hours, then with No. 0 sandpaper rub the surface lightly and apply another coat of shellac. If the article is of oak, ash, cherry or black walnut, three coats of shellac will be sufficient. It is not necessary to use the sandpaper between each coating, but it tends to make smoother work in the end, filling up the grain better. It should be remembered in applying the varnish that the more you put on the more difficult it will be to get the crevices smooth when you come to the next process, which is technically known as rubbing, and is done in the following manner: Having already filled the grain of the wood with shellac, you next proceed to rub it smooth and of an even surface. Take a piece of haircloth about 3 inches square, fold it once in the middle, dip this in raw linseed oil, and on it put some finely-powdered pumice-stone. With this proceed to rub the surface smooth, being careful not to bear too hard, or you may rub through entirely. After this is completed clean off the oil, using benzine for the purpose, wiping dry with a cloth used vigorously. When the article is of cherry ebonized, or of mahogany, it may be necessary to give a greater number of coats, mahogany particularly requiring from four to six to make a satisfactory finish.

Railway Stations.

We are indebted to Richard J. Evans, chief engineer of the Memphis, Selma and Brunswick Railroad, who is at present located at Holly Springs, Miss., for a very complete set of plans of a railway station, which he forwards in response to the question of a correspondent, whose letter was published in the July issue. We have made engravings from the plans and present the same herewith. The station shown is the standard building of its class adopted by the railroad company above named. It is considered suitable for the south and southwestern portions of the country, but would not be as well adapted to the severe climate of the northwest. Buildings of this class are now in progress along the line of the railway in question. Two of them, we are informed by Mr. Evans, have been completed and present a neat and pleasing appearance. He deems them of ample size for the limited business of stations along a new road. The framing of the building shown outside is dressed. The joints are worked and fitted and the edges are beveled. The framing is concealed on the inside with flooring, matched and worked, dressed, tongued, grooved and beaded. It is beaded on both sides in the passenger-room, and on the outside only in the freight-room and office. The roofing is of corrugated iron and the chimney is of terra-cotta. The platform for cotton and other bulky freight is located on the side of the track opposite the station, and is high enough to bring it level with the floor of the freight cars. The cost of a station built to this design, with platforms complete, including furniture and fittings, ready for use, the whole substantially constructed of best seasoned materials and neatly finished and painted, Mr. Evans informs us, is $725.



Railway Stations.—Plan Showing Station and Platform, Open Freight Platform and Tracks.—Scale, 1/4 Inch to the Foot.



End Elevation of Passenger-Room.—Scale, 1/8 Inch to the Foot.

In the timber belt of Western Washington Territory there are 20,000,000 acres covered with timber, most of which is included within the limits named—an area nearly equal to the compined areas of the States of Connecticut, Massachusetts, Vermont and New Hampshire. This timber belt will average 25,000 feet of lumber to the acre, or a total of 500,000,000,000 feet of lumber. Hence, the saw mills of Puget Sound, with their present capacity of 500,000,000 feet per year, would take 1000 years to cut it down. The fir trees frequently attain the hight of 250 feet, and planks of lumber are sometimes turned out of these mills 100 feet in length.

NOTES AND COMMENTS.

The formation and development of architectural associations in the West is a prominent feature of the day. The architects of Iowa arranged for a State convention some time since, to be held at Colfax, a leading summer resort, located 20 miles from Des Moines, the date of the meeting being fixed for the 12th of August. The architects of Missouri are to have a State convention at Kansas City early in January next, while the Western Association of Architects, which is a sort of congress of the different States, and other local organizations in the West, will hold its second annual meeting at St. Louis on the 11th of November next.

The matter of architectural proportion engages the attention of almost every student sooner or later. A number of works have been published upon this subject, some of which take the broad view of the subject and attempt to deduce principles from the most ancient authorities, while others are altogether empirical in their methods and attempt to lay down specific rules which shall determine the projection of a cornice, the hight of a door, the width of a window and the dimensions of all other parts of an ordinary dwelling or business building. The subject is an important one, and many have examined the published works without finding a satisfactory solution to their questions. For modern use there would seem to be no better rule than to follow established precedents, and instead of depending upon arbitrary rules to incorporate in plans those features which by experience have been found to please the eye and satisfy the taste. Professor Cockerell, writing on this subject as treated by ancient authorities, presents some facts which may be of interest to our readers: Vitruvius (lib. vi. c. 2, 3, 4, 6; lib. v. c. 1, and c. 2) gives us the experience of the ancients on this important subject. The Greek forum, says he, was a square, but the Roman was 3 by 2, because the gladiatorial shows were exhibited there; courts should have the proportions of 5 by 3 (the favorite of the learned Palladio), sometimes 3 by 2, or sesquilateral, or the diagonal of the square

will be the length. He lays down the proportions of all the apartments of the Greek and Roman house: *atria, alæ, tablinium and peristylium, triclinia, œci, exedræ et pinacothecæ.* He does not, however, establish any principle, and his rules are wholly empirical. But the great Alberti, not content without a principle, adopts the Pythagorean doctrine of universal harmony and agreement between sounds and numbers, namely, that what pleases the ear pleases also the eye. He lays down, therefore, his harmonic proportion, in which Blondel, Ouvrard and others have followed. The notion of musical proportions is common, and has occupied many ingenious minds already versed in that art. Describing St. Peter's, Byron in this feeling observes:

> Vastness which grows, but grows to harmonize,
> All musical in its immensities.

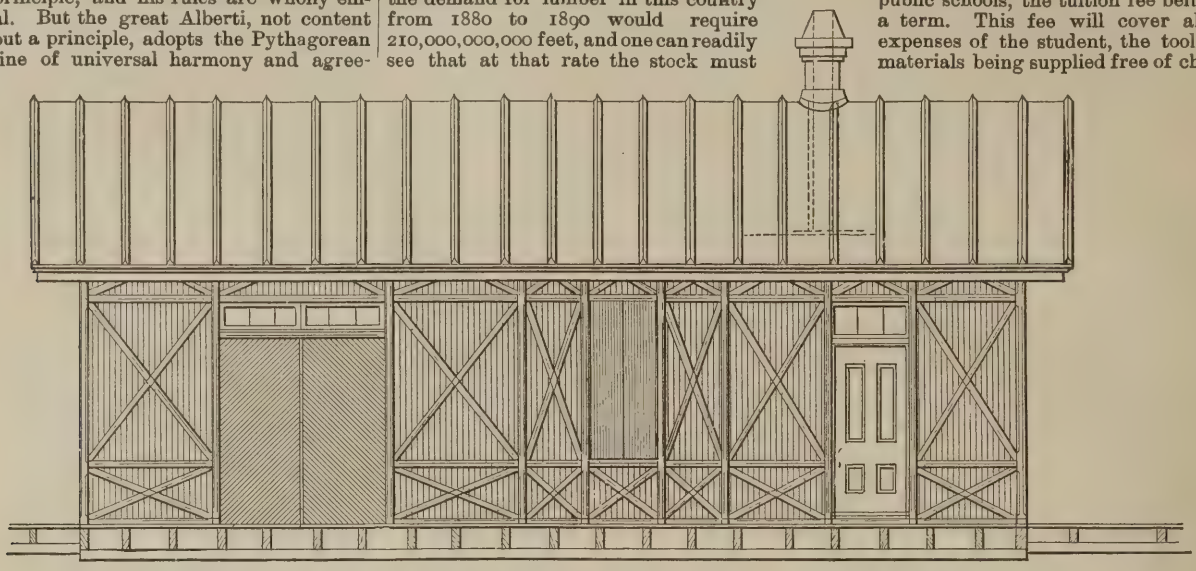
Alberti was the first also to establish the rules of arithmetical and geometrical proportions (lib. ix. c. 3, 4, 5, 6), applied to all the varieties of areas and capacities. He is followed by Palladio in the arithmetical and geometrical rules (lib. i. c. 23). It is a comfortable conclusion to the practical architect that the empirical rules of Vitruvius, the harmonic, the geometrical and arithmetical rules of Alberti and his followers, agree in the main, so that either may be adopted without material deviation from correctness; but the neglect of these rules, in which lie that hidden charm that every one must be sensible of when examining a finely proportioned room, has been common of late years, as if the principle were of no value. The zealous student, therefore, should carefully note that consent of the ancients and the most illustrious masters of the moderns here set forth; and he will soon learn devoutly to repeat the denunciation of the Hindu Vitruvius (Ram Raz, Asiatic Society, 1834, p. 15), "Woe to them who dwell in a house not built according to the proportions of symmetry."

Builders are interested in the general question of how much timber there is still remaining in this country, from the simple fact that the visible supply in a measure determines the price of this material from year to year. According to the Chicago *Current*, the stock of pine yet standing in Michigan can produce 40,000,000,000 feet of lumber if cut for that purpose. In eight years, therefore, at an average production of the State, the pine will have been used up. But such predictions have been made for years past. In 1867 the standing pine of Michigan was estimated to be 52,416,000,000 feet, and it was predicted that it would all be gone in 17 years. But since then the Saginaw Valley alone has produced about 12,000,000,000 feet, and will continue to cut in the neighborhood of 1,000,000,000 feet a year for 8 or 10 years to come. As pine grows scarcer it will make more lumber than when it was plenty. But in predicting the end of pine lumbering a person must take into account the timber which is yet standing in Wisconsin, Minnesota, Canada and the South. And it will be many years before it even grows scarce when we estimate the whole. Yet an end must come to the forests that the white race found in this country. Doubtless pine forest of the second growth will be raised for future use, but the present magnificent forests will disappear. It has been estimated that the demand for lumber in this country from 1880 to 1890 would require 210,000,000,000 feet, and one can readily see that at that rate the stock must soon be gone. There is only about 55,000,000,000 feet of pine in Canada, and that would go but a short way in saving the forests of the United States.

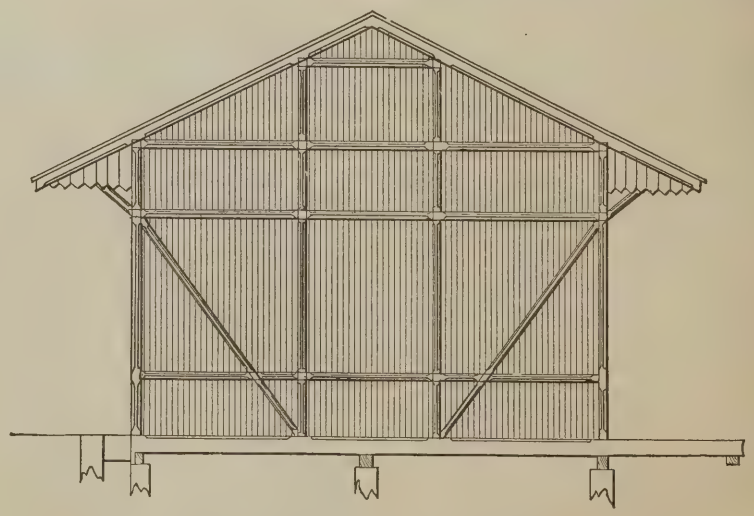
According to one of the Cleveland daily papers, there will soon be established in that city a trade school to be known as the Cleveland Manual Training School. The plan, which will be carried out as soon as the nenecessary amount of money is subscribed, is to erect and thoroughly equip a three-story brick building. The object of the school is to furnish practical instruction during the day in the principles underlying the mechanical industries to youths of suitable age who are receiving their intellectual training in the ordinary schools, and to give instruction in the evening by lectures in the same line, but of a more advanced character, to persons whose days are occupied with labor. The question of location has been one of serious consideration by the incorporators. The general opinion has, however, settled on the original plan—that of establishing the school within convenient distance of the Central High School, from which it is expected to draw the greater number of the training school pupils. The High School day closes at 2 o'clock. It is proposed to so arrange the classes that High School pupils will twice a week have three hours of work in the Manual Training School after leaving the High School. This will provide for three classes a week in each department of the training school.

The estimates for running the school are based on an attendance of 100 to 175 pupils, though the building will be of sufficient size to accommodate as many as 300. The school year will be divided the same as in the public schools, the tuition fee being $20 a term. This fee will cover all the expenses of the student, the tools and materials being supplied free of charge. The lower story of the school will be fitted up for classes in metal-working, the second for classes in wood-working, while the upper floor will be divided into lecture-rooms in which evening classes will be instructed in mechanics, physics, chemistry and mechanical drawing. In the West the value of trade schools is being very generally recognized, and already many of the large cities in that section of the country have their manual training schools. In the East there are also a number of schools of this kind, though some of them are of a more special nature, giving instruction only in a particular trade. Where the number is limited, schools for general instruction in manual training are probably more advantageous, but as these schools multiply specialization will be the natural result, the latter system, where possible, being of more direct benefit to the student.

All who conduct business upon the contract plan are sensible of the loss of time consumed in figuring upon work. It seems to be necessary to figure on several times as much work as is secured, and accordingly a very large proportion of the time spent in figuring must be considered a dead loss. Estimating is very particular work, and it requires the services of an expert. In many instances the highest priced and most experienced man in the establishment is kept busy upon work of this kind, and his position, as many of our readers know, is far from being a sinecure. Of late there has



Railway Stations.—Side Elevation Facing Track.—Scale, ⅛ Inch to the Foot.

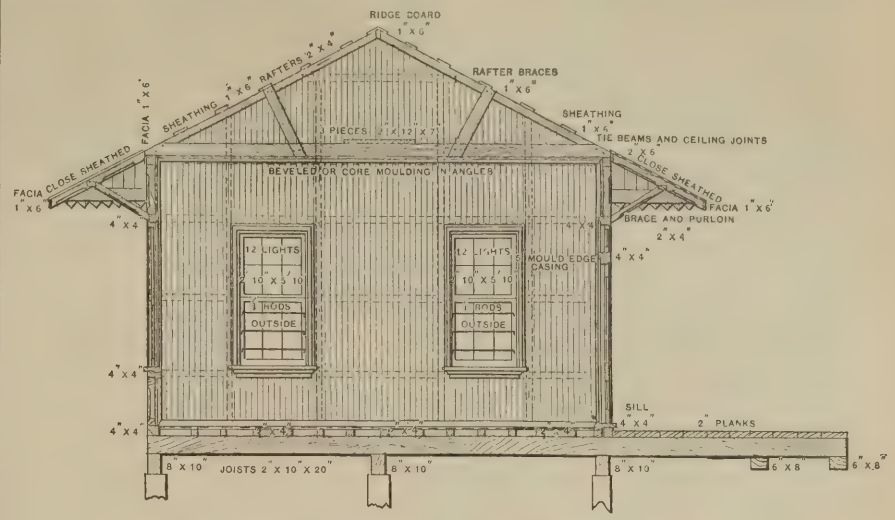


End Elevation of Freight-Room.—Scale, ⅛ Inch to the Foot.

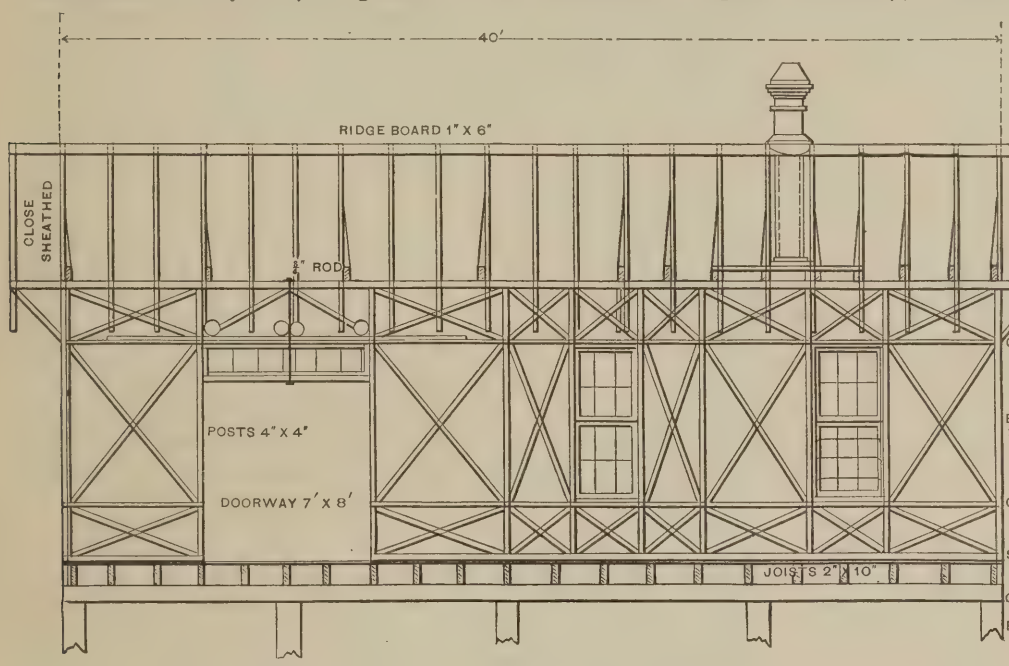
been some discussion among leading contractors and builders as to the justice of remuneration for time consumed in figuring on work. Builders are driven to a consideration of this matter from the fact that many schemes which are put on foot are altogether visionary in character. A capitalist may be determined to erect buildings on a certain plot of ground, provided their cost can be made so low as to give him a stipulated income upon the investment. Instead of depending upon the estimates of his architect, he invites competitive builders to figure upon the plans, never intimating to them, however, that the matter is experimental altogether, and that possibly they may not be built. We have known of cases where speculators have had several sets of plans figured upon in this way, finally abandoning the project altogether. It requires but little argument to show that in such cases a gross injustice is done to the men who spend their time and gave their skill in making the estimates.

In the Northwest, notably at St. Paul, a proposition is under consideration that leading contractors form an association, to the end that some means of securing pay for labor of this kind may be agreed upon. The ground is taken that contractors have as much right to pay for their paper-work as the architects. They claim, with great show of reason, that it requires time, study and brains to qualify a person for estimating, and insist upon it that he should receive a fair recompense for it. A similar effort has been made among architects to secure them against the loss incident to the preparation of plans in competition. Competitions are organized upon the basis of securing to the owners a large number of studies of a given structure, with the necessity of paying for only one, or perhaps three at the outside. The benefit of the best ideas of the dozen or 20 competitors is obtained without any remuneration to those advancing the ideas.

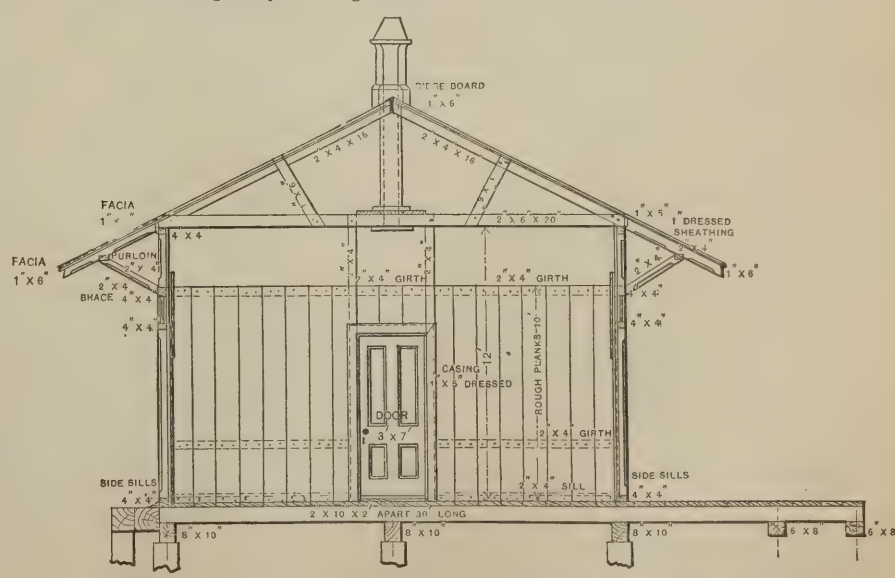
Several plans have been suggested for accomplishing the ends which the contractors have in view. One of these is that all figures on buildings to cost above a stipulated amount be paid for only to the unsuccessful competitors, the successful one having his renumeration included in the contract awarded to him. The writer who advances this suggestion claims that if architects knew that figuring was to be paid for upon some such a basis they would be more careful in selecting bidders, and would prefer those of acknowledged ability and responsibility, and would not allow men who are irresponsible to make bids at all. The weeding out of irresponsible contractors would seem to be an end in which every responsible builder is interested. The same principles could be made to apply in the case of sub-contractors. In short, there would seem to be no real difference in position as between the sub-contractor and the general contractor, save only in the amount of work to be done. Sub-contracts are frequently of the greatest importance, and the builder's contract, is in fact, only the sum total of the sub-contracts.


RIDGE BOARD 1" X 6"
RAFTERS 2" X 4"
RAFTER BRACES 1" X 6"
SHEATHING 1" X 6"
FACIA 1" X 6"
SHEATHING 1" X 6"
PIECES 2" X 12" X 7'
TIE BEAMS AND CEILING JOINTS 2" X 6"
BEVELED OR CORE MOULDING IN ANGLES
CLOSE SHEATHED
FACIA 1" X 6"
4" X 4"
BRACE AND PURLOIN 2" X 4"
12 LIGHTS 10" X 5' 10"
MOULD EDGE CASING
4" X 4"
2 RODS OUTSIDE
SILL 4" X 4"
2" PLANKS
8" X 10" JOISTS 2" X 10" X 20'
6" X 8"

Section Through Waiting-Room.—Scale, ⅛ Inch to the Foot.



Railway Stations.—Longitudinal Section, Showing Framing.—Scale, ⅛ Inch to the Foot.


RIDGE BOARD 1" X 6"
2" X 4" X 16"
FACIA 1"
1" X 5" 1" DRESSED SHEATHING
2" X 6" X 20'
PURLOIN 4" X 4"
FACIA 1" X 6"
2" X 4" BRACE 4" X 4"
2" X 4" GIRTH
2" X 4" GIRTH
1" X 6"
4" X 4"
CASING 1" X 5" DRESSED
ROUGH PLANKS-10"
DOOR 3' X 7'
2" X 4" GIRTH
SIDE SILLS 4" X 4"
2" X 4" SILL
SIDE SILLS 4" X 4"
2" X 10" X 2' APART 30' LONG
8" X 10"
6" X 8"

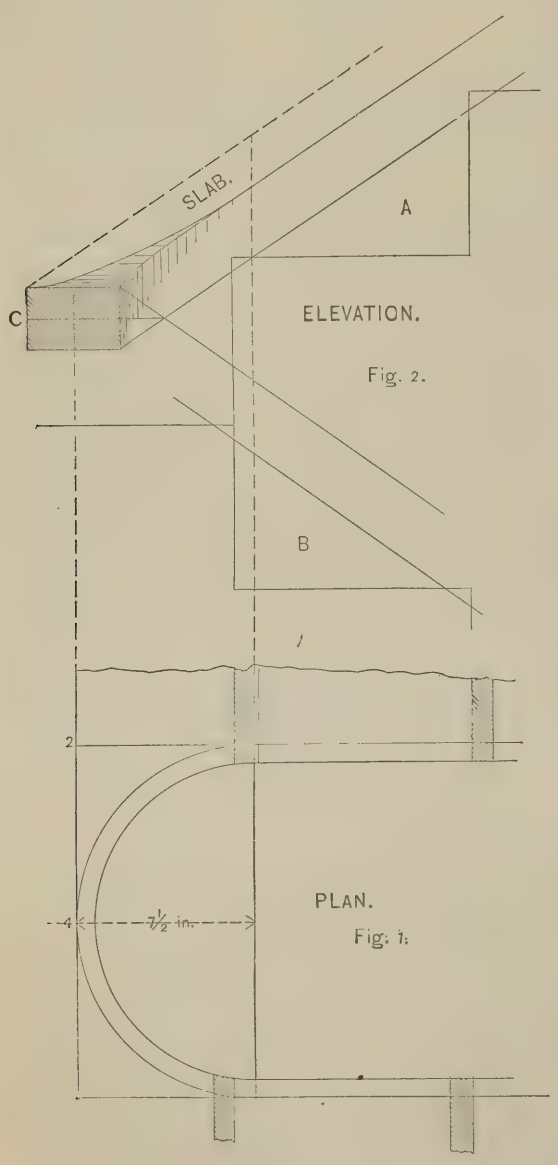
Section Through Freight-Room, Looking Toward Passenger-Room.—Scale, ⅛ Inch to Foot.

Amount of Timber in Railroad Ties.—Some one who enjoys statistics and is fond of making calculations has been estimating the amount of timber that is used for railroad ties. He reaches the conclusion that the timber consumed by railroads, in the United States alone, for cross-ties, which are renewed on an average every six years, would serve to construct nearly 1,000,000 frame houses, two stories high, 16 x 20 feet, with an addition of 12 x 12 feet. The following are some of the details of his calculations: The average tie is 8 feet long, 7 inches thick, and has a 9-inch facing. It contains 42 feet board measure. There are 2112 ties in a mile of railroad, or 88,704 feet of lumber. At the end of the year 1884 there were 120,379 miles of railroad in operation in this country, which consume for ties every six years 11,121,618,816 feet of timber. In such a house as the one mentioned there are used on an average 12,000 feet of lumber, aside from the shingles, lath, &c.

CORRESPONDENCE.

Hand-Railing.

From W. B. G., *New Edinburg, Ontario.*—I inclose a sketch for the benefit of your correspondent, "W. W. P," showing an easy method for railing platform stairs. Fig. 1 represents the plan of the stairs, Fig. 2 the elevation and Fig. 3 the shape of the mold. In Fig. 2 draw the upper and lower branches of the stairs, as shown at A and B. Draw lines to represent the rail, the under side resting on the center of the third baluster. At the intersection of the upper and lower sides draw the line marked C and set off the section of the rail. From the center drop a line to the plan, Fig. 1. Draw the cylinder, locating it as shown. Some stair-builders hold the opinion that the proper place for a cylinder in platform stairs is where its spring line and the face of riser will be in a straight line, independent of the size. I think that such an arrangement is wrong, and that the proper method is that which I have shown in my sketch. To find the mold take the pitch-board and set off the distance from center of cylinder to rail. Draw the width of rail and square up the lines 1, 2, 3, 4. Lay the pitch board on the long diameter and mark the lines 1, 2, 3, 4. Square up from 2 and 4, making 4 2 equal to 4 2 on pitch-board. Draw the shank the width of the straight rail and complete the mold by finding points and sweeping the curve with a string, or draw the same freehand. The elevation shows the slab that is taken off the side of the plank. The pitch-board gives the bevel for working the wreath.



Hand-Railing.—Figs. 1 and 2 Accompanying Letter from W. B. G.

Blackboards.

From B., *Mount Vernon, Ohio.*—We find that a very good blackboard can be made of paper in the following manner: Procure heavy manila paper, using that which weighs at least a pound to 3 square yards. The paper should be well calendered—that is, very smooth. Paste it in position on the wall where the blackboard is wanted. Bind down the edges with wooden moldings and construct a chalk-box at the bottom in the usual manner. Then cover the paper with three coats of liquid slating, and the result is a blackboard that is every way satisfactory.

Chimney Construction.

From J. M., *Woonsocket, R. I.*—How will it answer to have two 5-inch stove pipes entering a chimney having an 8 x 12 inch flue, the two pipes being on a given level? Will two pipes in a chimney, arranged in this manner, draw satisfactorily?

Answer.—It is very difficult to give an unconditional reply to the last question our correspondent proposes. The draft in a chimney is affected not only by the proximity of different pipes entering it, but also by the light of the chimney, the openings below where the pipes enter, and the smoothness of the flue in the inside. The draft of the chimney is further affected by its surroundings. If there is a high building in the neighborhood it may interfere with the draft when the wind is in certain directions. If the house stands below a hillside similar conditions may prevail at certain times. All these things must be taken into account in determining whether a flue will draw or not. On general principles it is bad practice to have two pipes entering a flue on the same level. When there is a column of dead air in the flue to be removed before the smoke can ascend freely, there is liability of the products of combustion passing from one pipe into the other on the opposite side instead of going up the chimney. Liability to annoyance of this kind is sometimes removed by placing elbows on the pipes inside of the flue, thus giving the smoke an upward direction and leaving less opportunity for it to find its way into the adjoining apartment. If our correspondent has an old chimney, this plan may be the best that he can adopt. If, on the other hand, it is a question of building a new chimney, we would advise a partition in the flue, even though it is made simply of sheet iron, to run a short distance above the entrance of these two pipes, so as to prevent the possibility of smoke drawing from one pipe into the other. The reason that smoke ascends in the flue is that heated air is lighter than cold air, and accordingly makes its way upward. In those cases in which the air in the opposite room is warmer than the external atmosphere, the weight of the column of cold air in the chimney would be sufficient to force the smoke into the opposite room instead of allowing it to pass up the chimney. For this reason warm flues always draw better than cold flues. A partition, as suggested above, would overcome many of the difficulties that the construction named would be liable to.

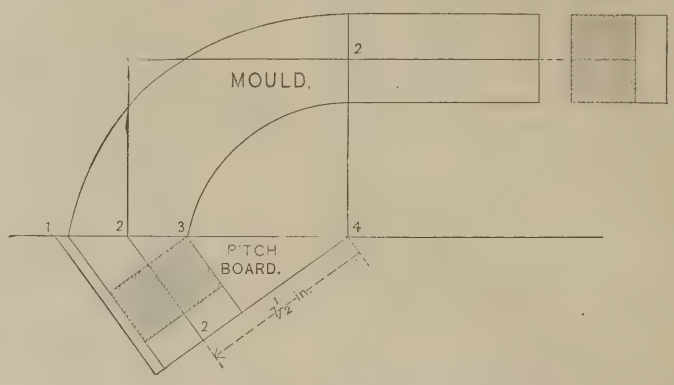
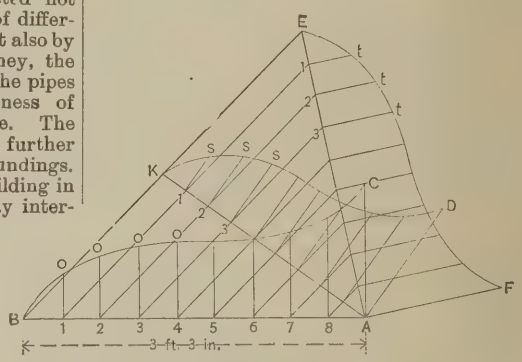


Fig. 3 of Diagrams Inclosed by W. B. G.—Shape of Mold.

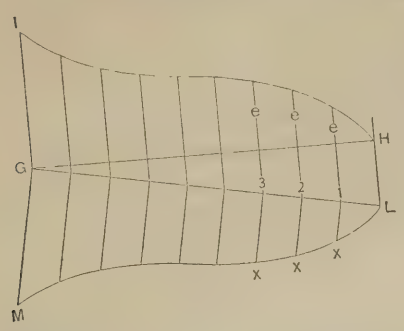
Profiles of Rafters.

From F. M. C., *Cuba, N. Y.*—In the April number of *Carpentry and Building* I noticed a question from "C. A.," of Chicago, with regard to finding the outlines of different lengths of rafters on an octagon bay window. Although I am not a regular reader of the paper, I take the liberty of presenting a method which I have used in practice for the last 15 years, and which I consider very desirable for the purpose. From the ground plan presented with the original question I have constructed the inclosed diagrams. In Fig. 1 let B A C be the outline of the regular straight rafter, B A being the base and A C being the rise. Divide the base B A into any convenient number of equal parts, as indicated by the small figures. From each of the divisions thus established erect a line perpendicular to B A, cutting the outline of the rafter, as indicated by O O O, &c. From the foot of each perpendicular line draw lines parallel to B E, extending them until they intersect the base line of the valley rafter A E, as shown, Make A D and A F equal to A C, and erect perpendicular to A K and A E, as indicated by 1 *s*, 2 *s*, 3 *s*, 1 *t*, 2 *t*, 3 *t*. Then with the dividers make 1 *s* and 1 *t* equal to 1 O. Likewise make 2 *s* and 2 *t* equal to 2 O and so continue for the remainder of the perpendicular lines. Then trace through the points thus established the outlines D K and F *t* E. Then the profile outlines of the rafter A K and valley A E will be complete. The hip rafter may be found in the same general way. Let I G H, Fig. 2, be the outline of the regular rafter.



Profiles of Rafters.—Fig. 1 of Sketches from F. M. C.

Let G L be the seat of the hip rafter. It is evident that the hip rafter will be as much longer than the straight rafter as G L is longer than G H. Divide the given rafter into equal parts, as in the first figure, and

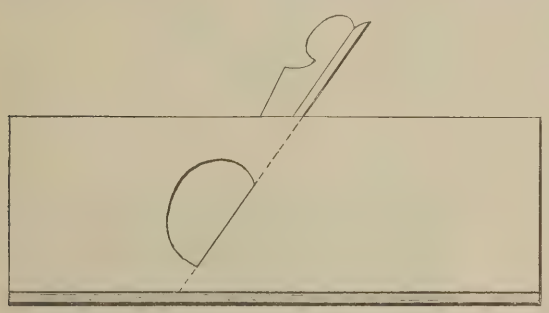


Profiles of Rafters.—Fig. 2 of Sketches from F. M. C.

extend the lines until they cut G L. Make G M, which is drawn at right angles to G L, equal in length to G I. Erect other lines perpendicular to G L in the points established in it by the lines from the normal rafter. Make these lines equal in length to the corresponding lines through the normal profile, and through the points thus established, as *x x x*, trace the outline of the rafter. Then M *x* L will be the profile sought.

Hand Sticking Tool.

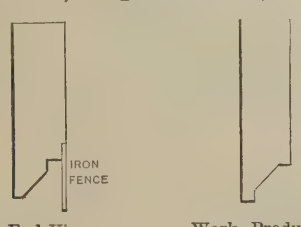
From T. J. G.—I have been a careful reader of *Carpentry and Building*, and am impressed with the idea that carpenters should do more to improve its pages. I hope what I have to offer at this time will be useful to the journal as well to builders at large. By the sketches inclosed I show a simple sticking tool that I got up for my own use some time since. The tools vary from ½ inch to 1¼ inches. I consider the tool far ahead of anything I have ever seen for sticking purposes. Further, the forms made are just in the hight of style, and as no hand tool was to be had for the purpose I was led to get up the article I now present to the public. The tool sticks from the edge, which makes it superior to the old quarter-rounds.



Side View of T. J. G's Hand Sticking Tool.

The Weight of Leaning Sash.

From G. H. C., *San Francisco, Cal.*—I inclose a sketch representing a number of window sash leaning against a wall. An argument between the contractor, the foreman, a night watchman, a police-



Details of T. J. G's Tool.

man and several others has been in progress as to the effect of the last sash on the first. After the sixth sash had been added to the pile the line of the center of gravity had been passed. The question is, Will or will not more sash added to the pile increase the weight against the first? Please answer and oblige.

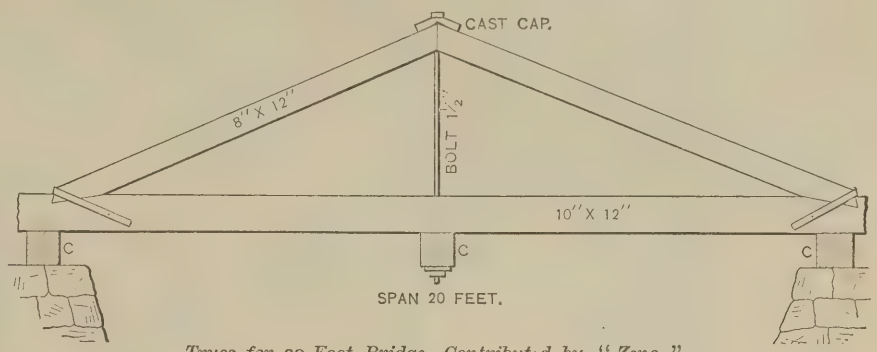
Answer.—We think it hardly necessary to make an engraving of the sketch which our correspondent incloses. It represents a lot of sash standing on end and leaning against a wall, as sash are very commonly piled. The projecting lip of the meeting rail of the first sash rests against the wall The same portion of the second sash rests against the face of the first, and so on through the lot. The lower end of the sash each time is set out sufficient to make the several sash form parallel lines. What our correspondent means by the line of the center of gravity requires a word of explanation. As indicated by his sketch, the line to which he refers runs from the foot of the first sash upward in a vertical direction. He refers to the fact of the sash having reached a point which makes the head of one of the leaning sash come outside of the foot of the sash first placed in position. This line, however, has nothing whatever to do with the problem, and may be ignored. The first sash, of course, exerts a certain pressure against the wall. By the conditions described the second sash presses as hard against the first as the first does against the wall. Accordingly, the actual pressure against the wall at any time may be determined by ascertaining the pressure of one sash inclined in the manner indicated, and multiplying that amount by the number of sash. The discussion of practical problems of this nature by a miscellaneous assembly very seldom results in correct solutions.

Building Association Problem.

From W. R., *Verona, Pa.*—I offer the following solution to the building-association problem presented by a correspondent in the January number of *Carpentry and Building:* The interest on payments of $60 each for 20 consecutive months is the same as the interest on $60 for the number of months corresponding to the sum of the arithmetical series, the first term being 19 and the last term 0, and the common difference 1. This gives 190 months. This is equivalent to the interest on $1 for 190 × 60, or 11,400 months, or the same thing may be expressed otherwise. It is equivalent to the interest on $1000 for 11.4 months. Now, the borrower having had the $1000 for 20 months, and having paid in money the interest on the amount and the interest of $1000 for 11.4 months, the excess of $200 between the amount borrowed and the amount paid back must be the interest on $1000 for 20 − 11.4, or 8.6, months. The rate of interest must therefore be 200 ÷ (8.6 × 1000) = .023256, or 2.3256 per cent. per month.

Bridge Designs.

From ZENO, *Gardiner, N. Y.*—I inclose sketches of two road bridges which are in use near this place. I think they will be acceptable answers to the inquiry of "G. H. B." The drawings explain themselves in nearly all particulars. The timbers marked A in the larger bridge are 6 x 8. The floor beams B are 4 x 6, placed parallel with the cords, and upon them the planks are spiked. In the smaller bridge the floor beams are put on timbers under the cords. The ends of these are shown at C in the sketch.



Truss for 20-Foot Bridge, Contributed by "Zeno."

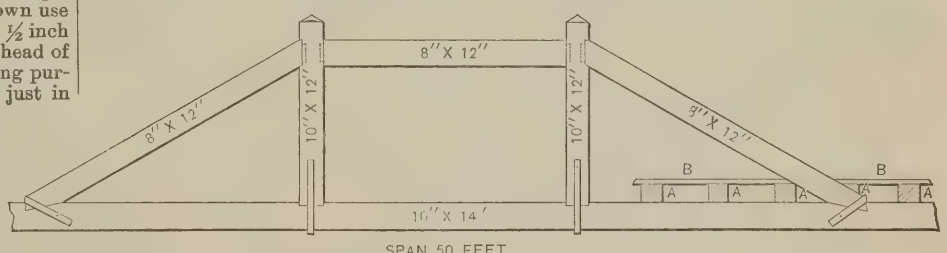
Cistern Plastering.

From J. N. H., *Chattanooga, Tenn.*—In answer to the question from "W. S. S.," for the best cement to use in cistern work, I would say that for laying up the brick one part of good hydraulic cement with three parts sharp, coarse sand answers an excellent purpose. For plastering the inside I would advise the use of one part cement and one part sharp sand. Portland cement is best for the purpose, although Louisville cement is very good, and for those who are located conveniently to that point its cost is considerably less than Portland cement.

Names of Hardware.

From G. W. R., *Santa Cruz, Cal.*—Will some reader of *Carpentry and Building* be kind enough to enlighten me a little on the difference between a desk butt and a back flap? A Bostonian and I have had an argument over the question. I should also be glad to have another question answered. If I should ask for a hasp in New York or Boston, would I simply get a hook and two staples, without any band with a slot in it through which to hook?

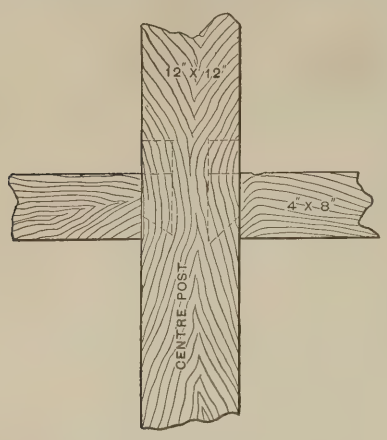
Answer.—There is a distinctive difference, as we understand it, between a desk butt and a back flap. The latter has one part longer than the other, and is used on table work. A desk butt has the two parts of the same length. With reference to the hasp, we think the usual custom of the trade is to supply a hasp when it is asked for, but probably our correspondent on asking as above mentioned would be furnished with it without the staples. The latter might be omitted unless they were particularly specified. We do not know of any instance wherein a hook and staples have been supplied under the name of hasp.



Truss for Bridge of 50-Foot Span, Contributed by "Zeno."

Octagon Barns.

From S L. M., *Newton, Kan.*—I inclose plans and sections showing the construction of octagon barns as sometimes put up in this section of country, which I think may prove of interest to the readers of *Carpentry and Building*. Referring to the foundation plan, the sills are 6 x 8 inches, halved together. The angle sills are 4 x 8 inches, mitered. The cross timbers are 4 x 8 inches, halved in. The wall plate is 2 x 8 inches. The dimen-

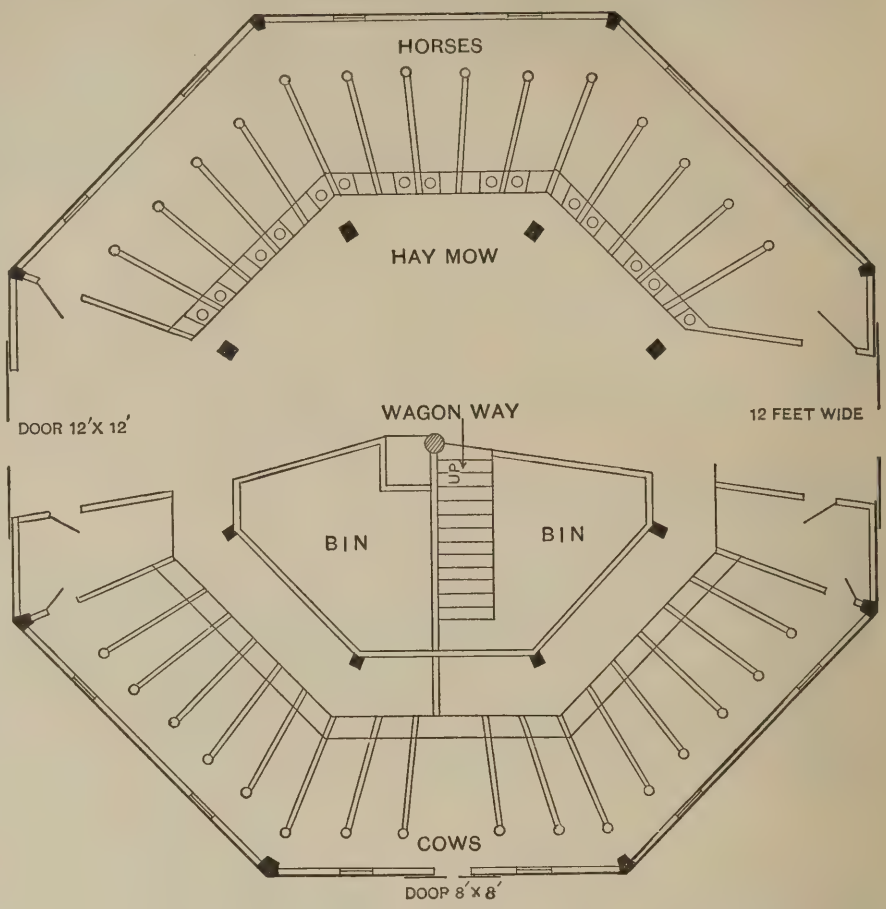


Octagon Barns.—Detail of Framing.

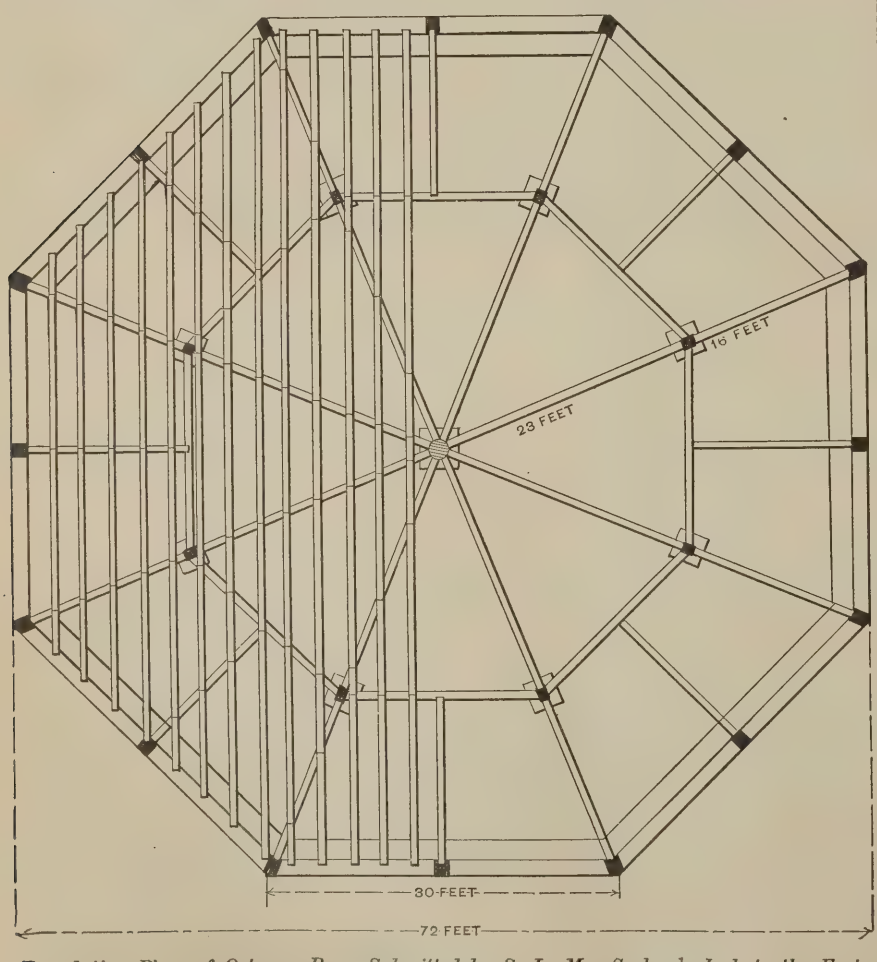
sions of the different parts, as well as details of construction, are shown upon my drawings to such an extent that further description seems hardly necessary.

From G. N., *Aberdour, Ontario.*—I inclose some drawings which will indicate the construction of octagon barns as occasionally practiced in this section of the country. I also inclose a clipping from a local newspaper, which gives particulars with reference to the construction of barns of this character.

Note.—The engravings at the bottom of page 179 have been made from the inclosures sent by this correspondent. Some particulars gleaned from the newspaper clipping to which he refers may be of interest to our readers. The article points out, among other advanges pertaining to this style of construction, the absence of cross-beams at other points than in the floor. It also directs attention to the free use of braces in the lines of the walls. The roof is described as an eight-sided "cone" strengthened with purlin



Plan of Octagon Barn Submitted by S. L. M.—Scale, $\frac{1}{16}$ Inch to the Foot.

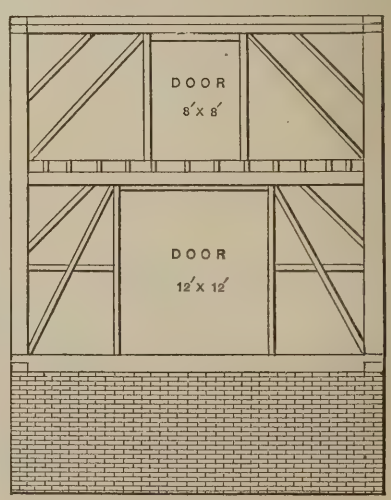


Foundation Plan of Octagon Barn Submitted by S. L. M.—Scale, $\frac{1}{16}$ Inch to the Foot.

plates. Referring to the plan, attention is directed to the fact that there are stalls for 52 animals, all facing toward the center of the barn. The feed-way is traversed by a driveway which leads through the barn. The space indicated by *e* in the plan is devoted to the storage of plows, wagons, machines, &c. The posts of which the framework is composed are 28 feet high.

Twisting of Doors.

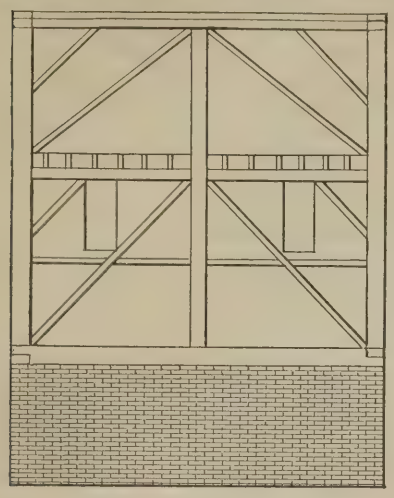
From S. F. B., *Wellington, Ohio.*—I will try to answer the questions raised by "C. A.," of Chicago, concerning the warping or twist-



Front Frame.

ing of doors. In the first place, it would appear that he has got a door stile made of flat-grained wood, harder on the inside than on the outside, and perhaps there is a fire opposite the door in the room. Under these circumstances I know of no course but to remove the stile and replace it with one made of the very best soft pine, having the grain running through from side to side instead of from edge to edge. When a door is

hung between heat and cold and has a hard, flat grained stile, in most cases it will curve and twist in the way your correspondent



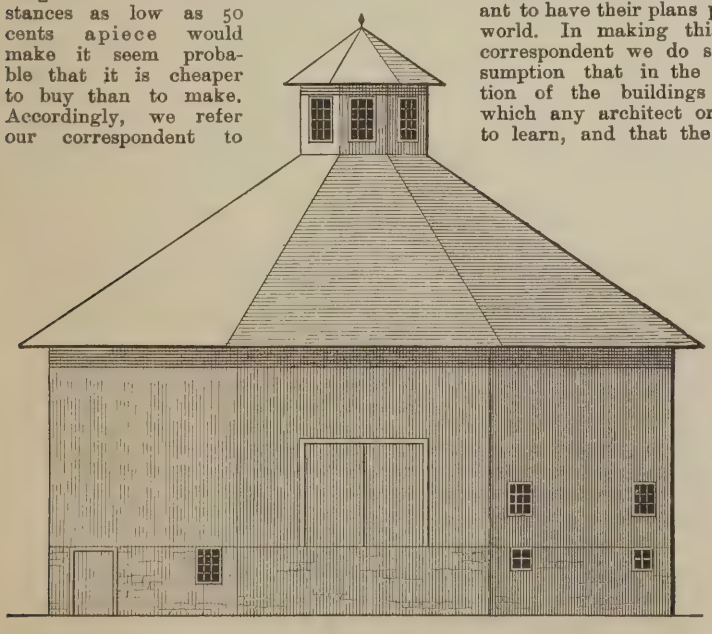
Octagon Barns.—Side Frame.

describes. A short time since I hung a door for a customer between the hall and sitting-room. An open grate was opposite the door, some 16 feet away. The door swings into the hall. As soon as the fire was built the door began to spring on the back edge. It sprung ¼ inch, and was so much out of shape as to require hard slamming to make it shut. The owner asked me to cut out the rebate top and bottom. I told him that the more I cut the more I might, and assured him that if he would let it alone until warmer weather it would be all right. The result has justified my prediction.

Pentagraph.

From A. S., *Nashville, Tenn.*—Please give me information, through *Carpentry and Building*, how to construct a pentagraph.

Answer.—We would gladly comply with this correspondent's request if we did not think our space could be more advantageously used for other purposes. The pressure on our columns at present is so great that we feel it necessary to discriminate in favor of those problems of the widest practical application. The fact that pentagraphs can be bought in some instances as low as 50 cents apiece would make it seem probable that it is cheaper to buy than to make. Accordingly, we refer our correspondent to the dealers in drawing materials or to the notion stores and agencies for such an article as he requires.

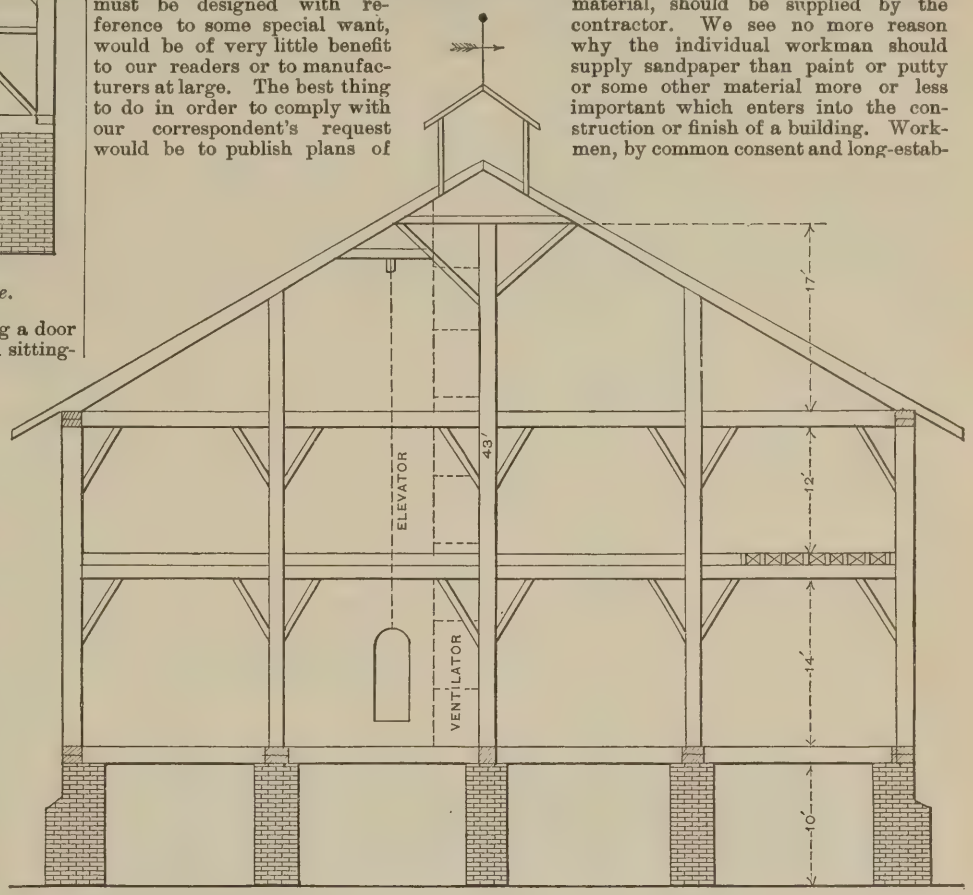


Elevation of Octagon Barn Contributed by G. N.

Machine Shops.

From S. O., *Denver, Col.*—I should like to see published in *Carpentry and Building* plans, specifications and estimates of cost of manufactories for both wood and iron work, also of blacksmith shops and foundries. The drawings should show arrangement in plan, with elevations and sections of buildings, together with necessary details. It seems to me that studies of this kind would be useful to a large class of readers.

Answer.—The mere theoretical consideration of problems of this kind, since every feature of a manufacturing establishment must be designed with reference to some special want, would be of very little benefit to our readers or to manufacturers at large. The best thing to do in order to comply with our correspondent's request would be to publish plans of buildings already in use for this purpose. This is scarcely feasible, however, from the fact that those who have model establishments are in many cases very reluctant to have their plans published to the world. In making this reply to our correspondent we do so upon the assumption that in the mere construction of the buildings there is little which any architect or builder needs to learn, and that the features about which he is most anxious to be informed are those which relate to special adaptation and the management of work. The question has occasionally arisen in the past, but we have not acted upon the suggestions of our readers for the reasons above stated, and because only a comparatively small number would be benefited by such publication. There have always seemed to be other problems of more interest to the majority of our readers; hence the discrimination.

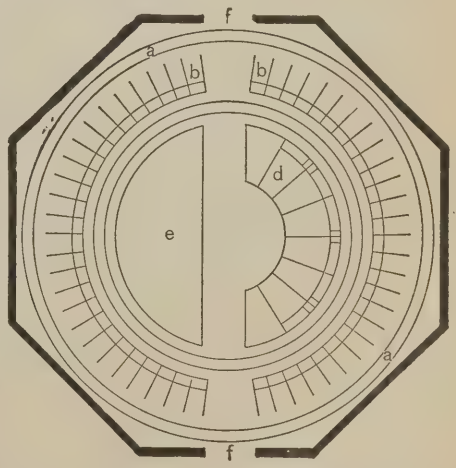


Section Through S. L. M's Barn.—Scale, $\frac{1}{16}$ Inch to the Foot.

Sandpaper.

From A. A. B., *Elk City, Kans.*—I would like to inquire, through *Carpentry and Building*, whose place it is by rights to furnish sandpaper in ordinary carpenter work? Should the contractor supply it or should each individual workman furnish it for his own use?

Answer.—The reply to this question depends in some measure on the nature of the agreement existing between the contractor and the individual workmen. If the workman agreed to supply labor only, it would seem that sandpaper, which is clearly a material, should be supplied by the contractor. We see no more reason why the individual workman should supply sandpaper than paint or putty or some other material more or less important which enters into the construction or finish of a building. Workmen, by common consent and long-established custom, supply the tools with which they perform their labor, but sandpaper which is consumed as the work progresses cannot be classed as a tool. Further than this, much more of it is required in some cases than in others. Occasionally so little of it would be used as to be no particular expense to the workman. In other instances a large quantity is needed, and its cost becomes an item of no small moment, particularly to a workman who is paid by the day. We think the safest plan under all circumstances

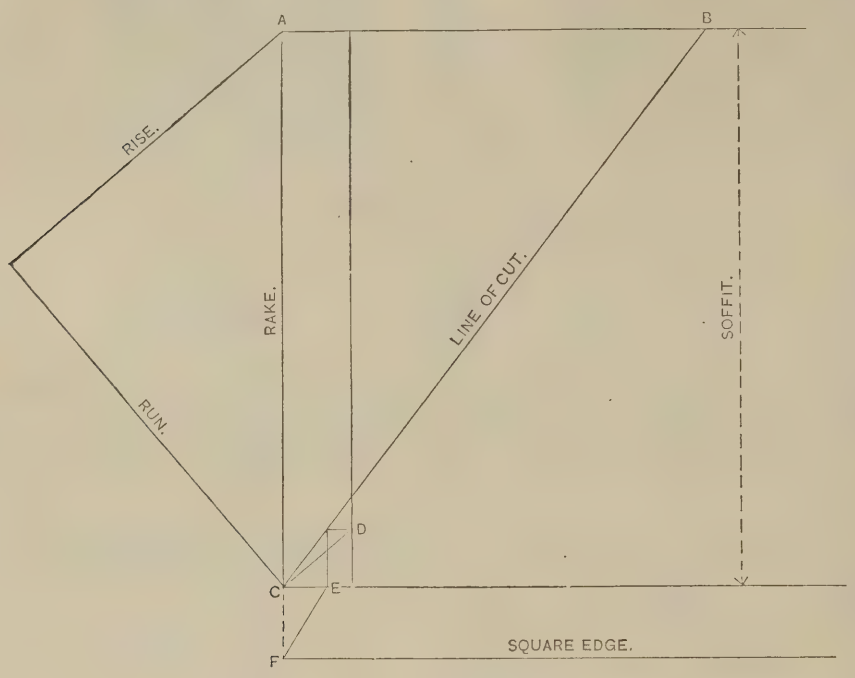


Plan of Octagon Barn Contributed by G. N.

would be an agreement in advance concerning sandpaper as well as upon all similar questions.

Soffit Bevels.

From W. A. D., *Lowell, Mass.*—In reply to "J. D. R.," who presented the problem in soffit bevels some time since, I offer the following solution: Let A B in the diagram be equal to the run. Draw a line forming a right angle with the run from C, the face of soffit to intersect with the back at D. Draw a horizontal line from D, intersecting C B, as shown. From this intersection draw a



Soffit Bevels.—Diagram with Letter from W. A. D.

vertical line intersecting the edge at E. Lay off the width of the stuff measured on the edge, as shown, and from E draw a line from the corner, as shown by E F. Then the line E F is the direction of the cut on the square edge. If the lower edge of the soffit is beveled according to the line C D, the line of cut will, of course, be square.

From C. J., *Omaha, Neb.*—I understand from the sketch submitted by "J. D. R.," of Syracuse, N. Y., that he is looking for a rule by which to obtain splayed bevels, and not soffit bevels. In answer I would say that the given bevel or pitch is the correct bevel in all cases both for ends and edges of splayed members. If the pitch is 2 inches in 6 inches, set the bevel at 6 inches on the tongue of the square and 2 inches on the blade. The cuts for the intersecting ends will be at right angles with the face edge. If a miter joint is desired the bevel will in all cases be at an angle of 45°. The word soffit, if I am correct, refers only to ornamental ceilings over recesses, but may be applied to top members of a splay.

Note.—With reference to the definition of terms in our correspondent's letter we would remark that splay, in its ordinary meaning, refers to the angle or flare of the work rather than the position in which it occurs. Soffit, in turn, refers to a ceiling, somewhat in the sense in which our correspondent describes, but also to the lower side of a cornice. What the original question referred to might perhaps be best designated by the term of splayed soffits, splayed expressing the fact of flaring, and soffit indicating the position in which the work is used.

Timber Measurement.

In our comments on this question when it was first presented we referred to the varying results obtained by different methods of measurement, and intimated that in different portions of the country different customs might prevail with reference to problems of this kind. We also suggested, although we did not express it in so many words, that the actual cubic contents of a piece of timber of this shape might not be fair to both buyer and seller. In sawing timber of the shape indicated there is a waste that must be taken into account either in the measurement or in the price. The problem presented admits of two kinds of answers, one the method of determining the net board measure in a timber of the shape indicated, and the other the basis of a fair measurement, all the circumstances considered, including waste, &c., as between buyer and seller. The answers that the question has called out, only a portion of which we have found space to insert, have approached the problem from both points of view. In this instance, as in many others, by presenting a number of the answers sent in by correspondents, we are able to show a variety of conceptions of the problem, which cannot fail to be of far more interest to our readers than any answer that could have been given without their assistance.

From W. J. L. P., *Alleghany City.*—Referring to the question in timber measurement proposed by "J. W. J.," of Watertown, N. Y., I find that 156 feet is the correct answer. I send two solutions which may be of interest to your readers. Let Fig. 1 represent the base of the timber, which is 18 inches square, and let the inner square marked O represent the upper base, which is 6 inches square. Fig. 2 represents the length of the timber. By cutting through on lines 1 2 and 3 4 of Fig. 1, we have a plank which is in the shape of Fig. 2, and which is 6 inches thick, and which by measurement is equal to 72 feet. We also have the pieces B and B, which are square at the bottom and have no thickness at the top. They are 6 inches wide, as marked in the cut. Now, if we place them one on the other, end for end, we shall have a timber 6 inches square and 12 feet long, which by measurement would equal 36 feet. There are also the corners A A A A. Withdraw the pieces of which we have already found the contents, and close in the corner pieces. We shall have as a result a stick which is 12 inches square at the bottom and 12 feet long, without any area at the top. The volume of this piece is equal to the product of its base multiplied by one-third of its attitude, which is 48 feet By taking the sum of these several products, namely, 72 feet + 36 feet + 48 feet, we have the contents of the entire piece, or 156 feet.

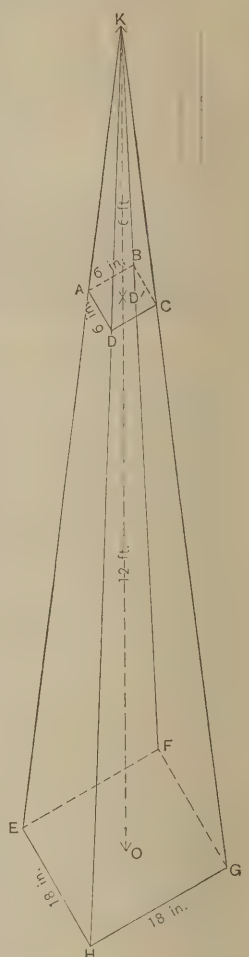


Fig. 3 of Diagrams from W. J. L. P.

Fig. 3 shows the same timber in the form of a frustum of a pyramid. The pyramid to which this frustum belongs is 18 feet high, or, in other words, the altitude of the pyramid is 18 feet. Since the base is 18 inches and the altitude 18 feet, then the volume of contents of the pyramid is equal to the product of its base multiplied by one-third of its altitude; that is to say, $\frac{18 \times 18}{12} = 27$ feet, $\times$ 6 = 162 feet. Now, since the pyramid is 18 feet high and the timber is only 12 feet high, we must calculate the contents of the smaller pyramid. The base of this is 6 inches square and the altitude is 6 feet; then the area will be equal to the product of its base multiplied by one-third of its altitude, which gives 6 feet. Subtract the contents of the smaller pyramid from the the larger—that is, 162 feet — 6 feet—we have 156 feet, the volume of the frustum, or the contents of the piece of timber first described.

From C. S. C., *Anaconda, Mon.*—The stick of timber is 18 inches square at one end, 6 inches square at the other, and 12 feet long. It may be termed the frustum of a pyramid. The rule in such cases to find the solidity is to multiply the areas of the two bases together and extract the square root of the product. This root will be the area of a base which is a mean proportional

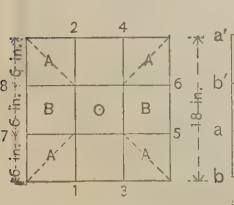


Fig. 1.

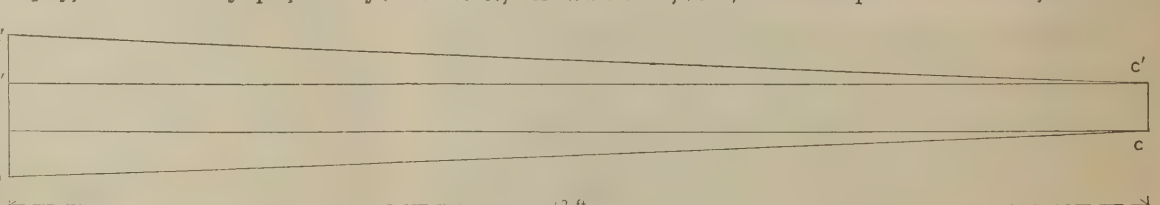


Fig. 2.

Problem in Timber Measurement.—Figs. 1 and 2 of Sketches Accompanying Letter from W. J. L. P.

between the other two. Take the sum of the areas of the three bases and multiply by one-third of the altitude. The product will be the solidity. The result is 156 feet board measure, which is the correct answer.

From J. T. D., *Monroe, Wis.*—Referring to the measurements of a stick of timber 12 feet long, 18 inches square at one end and 6 inches square at the other, I would say that by making an end view of the stick, as shown by the accompanying sketch, it will be seen to consist of a central prism $0.5 \times 0.5 \times 12$ feet $= 3$ cubic feet. There are also four wedges, the bases of which measure 0.5×0.5, and which are the same hight. Their contents are 6 cubic feet. There are likewise four pyramids of the same base dimensions and of the same hight, each of which contains 4 cubic feet. The total is 13 cubic feet, which, multiplied by 12 to reduce it to board measure, gives 156 feet board measure.

The stick may also be regarded as a prismoid whose contents are equal to the sum of the two end areas, plus four times the middle area, multiplied by one-sixth of the length. The end area is $1.5 \times 1.5 = 2.25$. The middle area is 1×4 gives 4 feet. The area of the small end is $0.5 \times 0.5 = 0.25$. The total of these are 6.5, which, multiplied by one-sixth of the length, gives 13 cubic feet; or, reduced to board measure, as in the previous case, 156 feet board measure.

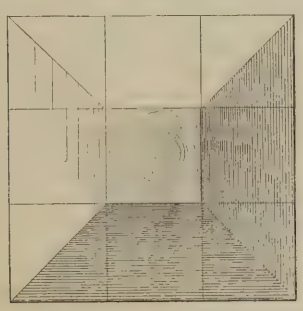
The stick is also the frustum of a pyramid whose contents are equal to the sum of the two end areas, plus the mean proportional between the two, multiplied by one-third of the length.

Thus the end
area equals $1\ 5 \times 1\ 5 = 2.25$

Mean area, $\sqrt{2.25 \times .25} = 0.75$
Small end area $0.5 \times 0.5 = 0.25$

Total..... $3.25 \times 4 = 13$ cubic feet. This, reduced to board measure, gives the same result as previously.

If the sum of the two end areas be multiplied by the length, it will give 15 cubic feet, or 180 feet board measure, which is 2 cubic feet too large. The middle area multiplied by the length gives 12 cubic feet, or 144 feet board measure, which is 1 cubic foot, or 12 feet board measure, too small.



Problem in Timber Measurement —Diagram Accompanying Letter from J. T. D.

From F. W. B., *Hoosick Falls, N. Y.*—In regard to the problem in timber measurement submitted by "J. W. J.," in July number, I would say that the stick described is the frustum of a pyramid. To find the number of feet board measure which it contains, add the areas of the two ends and a mean proportional between them together, and divide this sum by 3. The quantity thus obtained will be the area of the section of a stick of timber, which, being the same length, will contain the same number of feet. In this case the areas of the two ends are $6 \times 6 = 36$, and $18 \times 18 = 324$. As the product of two numbers is a mean proportional between their squares, then $6 \times 18 = 108$, is the mean proportional between the ends. Taking the sum of these three quantities, namely $36 + 108 + 304$, and dividing the sum by 3, gives 156, which, multiplied by the length of the stick and divided by 12, will give the number of feet board measure contained—that is, 156 feet.

I would like to know how to measure the stick so as to get 180 feet.

Note.—With reference to our correspondent's inquiry in the last paragraph we would refer him to other letters in this series. "J. H. M.," whose letter follows, and "J. T. D," whose letter appears above, have answered the question so satisfactorily that no further remarks from us are necessary.

From J. B., *Omaha, Neb.*—My method of solving the problem is as follows: Square the large end, which gives 324; square the small end, which gives 36. Multiply one side of the large end (18) by one side of the small end (6), which gives 108. Add these several lines together, giving a total of 468. Multiply this by the length, which gives 5616. Divide this by 144, which gives 13 cubic feet, or 156 feet board measure

From J. C., *Salt Springs, N. Y.*—Concerning the problem submitted by "J. W. J.," I submit the following solution: $0.05^2 + 1.5^2 = 2.5$; $\left(2.5 + \sqrt{0.25 \times 2.25}\right) \times \overline{12 \div 3} =$ 13 cubic feet; 13 cubic feet $\times$ 12 = 156 feet, lumber measure. The stick of timber in question represents the frustum of a pyramid, and is treated accordingly, which, in my opinion, is the correct method, and evidently the one employed by the lumber dealer, since it obtains the same results.

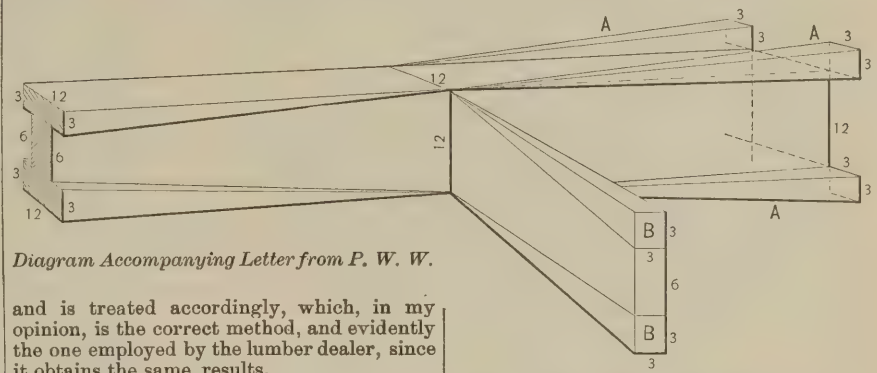


Diagram Accompanying Letter from P. W. W.

From J. H. M., *Butte City, Cal.*—In answer to the problem proposed by "J. W. J.," I would say that I have been a surveyor of timber of various kinds for many years. The following rule is one that will prove adequate under the circumstances, and one that is also very simple: Square both ends, add the amounts together, multiply this sum by the length and divide by 24:

Thus 18×18.....	324
6×6.....	36
Total.....	360

This sum, 360, multiplied by 12, gives 4320, which, divided by 24, gives 180, which is the board measure of the stick in question.

From R. N. P., *Lacrosse, Wis.*—In answer to the inquiry of "J. W. J.," of Watertown, New York, concerning a stick of timber 18 inches square at one end and 6 inches square at the other and 12 feet long, I offer the following solution: The large end, 18 inches square, contains 324 square inches. The section at the center measures 12 inches, and therefore contains 144 square inches, while the square of the small end is 36 square inches, making in all 504 square inches, which, divided by 3, gives 168 as the average. Since the timber is 12 feet long, the contents would be 168 feet board measure. To square the large end would be too large; to square the small end would be too little. As the first inch is tapering, the large end would more than make up the loss of the small end; hence I square both ends and the center, and average by dividing by 3.

Note.—The solution offered by this correspondent is certainly ingenious, and he much more closely approximates a correct result than some others. There is no good basis for his rule, however. He has evidently worked out this method by casual inspection rather than from a knowledge of the mathematical principles underlying the problem.

From P. W. W., *Worcester, Mass.*—There is so little "tapered" timber used that there is really no custom that would warrant a man in refusing to pay for more than what the stick would measure if averaged midway of its length, and the results of extra measurement would hardly compensate for the necessary labor of geometrical calculations. You cannot pour the contents of a 2-quart measure into a vessel holding but 3 pints without leaving a surplus. Neither can you take 3 inches from all around an 18-inch square timber and fill 3 inches all around a 6-inch square timber without having some left. So I contend that the piece of timber in question (18 inches square at one end, tapering to 6 inches at the other end, 12 feet long) contains 173 feet, or a surplus of eight pieces 3 inches square at one end and tapering to a point, in addition to the 144 feet which the stick would appear to contain from common measurement.

Note.—The diagram sent in by this correspondent presents a very ingenious conception of the shape under discussion. Unfortunately for his theory, however, it proves entirely too much. It is, in fact, an excellent demonstration of the correctness of some of the rules sent in by others, but close investigation of it upon our part has failed to reveal how our contributor uses the shapes shown to make the contents 173 feet. The eight pieces surplus, to which he alludes, would, when properly combined, form two square pyramids, each measuring 6 inches at the base and 6 feet in hight. Their contents by the rule applicable in such cases, namely multiplying the area of the base (36 square inches) by the hight (72 inches), and taking one-third of the product, reduced to board measure, would be 6 feet each, or 12 feet for the two. This added to the contents of the straight stick shown in the diagram (144 feet) gives 156 feet, a very different result from that expressed in our correspondent's letter.

REFERRED TO OUR READERS.

The Thirteenth Competition.

From L., *New Richmond, Wis.*—I have profited advantageously on a previous occasion by the suggestions of correspondents of *Carpentry and Building*. I come again for information. I am about to erect a suburban residence of moderate cost. I have decided that the plan of Mr. Bishop in the Thirteenth Competition will suit me. A correspondent some time since—namely, "R. R. J.," Oliphant, Pa.—mentions having seen a building erected to this plan, and states that it was painted in appropriate colors and was very attractive in its general appearance. Will he not kindly give some idea of the colors and how they were applied? I would also like to know whether the angles or offsets in the outline of the roof in the left elevation (Volume 6, page 70) add much to the outward symmetry. Their omission would save labor and material. Can any one suggest a plan for connecting the kitchen stove or range with the chimney, so that the dining-room shall not be unduly heated?

Questions on Hand-Railing.

From W. B. G., *New Edinburg, Ontario.*—I desire to request "W. H. C.," of Orillia, Ontario, to state how he would rail the stair which appeared in the February number of *Carpentry and Building* for 1884, and apart from the tangent system. I also desire him to place before the students of *Carpentry and Building* the errors and false principles of the tangent system. Many possibly have been led to believe that the system as ex-

pounded by Ridell is sufficient in all cases. I also desire to learn where a work containing Perry's system can be procured. I have made many inquiries for the work, but so far have failed to find it.

Road Bridges.

From F. K. GRINDLEY, *Illinois.*—I would like to see some plans for country wagon bridges of from 30 to 60 foot plans published in *Carpentry and Building.* This is a prairie country, and we have to ship our timber from a distance, so that we only want to use such size timbers as are necessary to make them safe. The demand is for low-price wooden bridges built mostly of oak. If some of the practical readers will furnish plans of this kind they will confer a great favor.

TRADE NOTES.

A VERY HANDSOME pamphlet, accompanied by several loose circulars illustrating a number of specialties, has been received from the Lane Mfg. Co., of Montpelier, Vt. This company some time since succeeded to the firm of Lane, Pitkin & Brock. The pamphlet is a very handsome specimen of typography and illustration, and is devoted to sawmills. Very careful descriptions accompany the several illustrations, and all the information necessary to an intelligent order is presented. The present pamphlet, we are informed, is only a few preliminary sheets gathered together and issued at the present time on account of delay in the completion of engravings for a larger and more complete book which will be published later. Among the machinery shown may be mentioned Lane's patent lever-set circular sawmill, an excellent engraving of which is presented on a folded plate. This cut has been prepared with unusual care, and shows, in addition to the machinery, certain accessories indicative of logging and lumbering. This general view is supplemented by various details of construction, also carefully engraved making in some respects the most complete description of a sawmill that it has ever been our opportunity to examine. Special attachments are also described with similar fidelity, following which are tables of specifications and weights of the different sizes of machines. There is also shown the same mill as originally manufactured, and also some special mills. The loose circulars illustrate an improved power-feed double-edger, a cutting off bench, shingle machines, heading machines and jointers, planing machines, matchers, &c.

THE ADVERTISING pamphlets issued by some of the stove companies take high rank in point of literary merit, excellence of engravings and general typographical features. Among the neatest publications of this kind that have reached us is one issued by the Richmond Stove Company, of Norwich, Conn. It is entitled "Heating." The subject is considered under two heads, "The Heater" and "Who Shall Be Heated?" with a closing chapter on ventilation. It directs special attention to the form of hot-air furnaces manufactured by this company, some notice of which has already appeared in our columns. The little pamphlet is sent free to all applicants.

THE WORKS of the Garry Iron Roofing Company, at Cleveland, Ohio, were destroyed by fire early in June. In the interval the company have rebuilt their establishment upon an enlarged scale, and have supplied it with new and improved machinery, and for some time past have been in position to fill orders promptly. The company are doing a very large business, their special form of iron roofing being held in high esteem by many builders throughout the country.

WE HAVE RECEIVED from the Cincinnati Corrugating Company a copy of the new edition of their 33-page catalogue, a prominent feature of which is an engraving of the medal recently awarded that company for their display at the World's Industrial and Centennial Cotton Exposition. This company displayed characteristic enterprise in securing a *fac-simile* of the medal, which is in duplicate for all first-class awards, before it was formally issued, and the engraving which it prepared was accordingly the first representation of the medal which reached many of the successful exhibitors.

THE EGAN COMPANY, of Cincinnati, direct attention to the great change which has recently taken place in the wants of the trade in the quality of machinery called for. The rage for something cheap, they say, has given place to labor-saving qualities and durability. It needs but little argument to show that purchases of machinery of the better class are in the interest of real economy, and that so-called cheap machines are in reality the most expensive that can be purchased. Prices are very low at the present time, and the manufacturer who secures a first-class machine at the present rates will not only secure a cheap machine, but also one that will be of substantial advantage to him in long years of use. During the past season this company have introduced a very considerable number of new machines which may be described as specialties, and which have been designed for the special purpose of accomplishing more work in the same space and with the same power, and at the same time doing it better, than the old patterns which they have superseded.

WE ARE IN receipt of a volume of nearly 200 pages, entitled "The Transactions of the Architectural Association of Minnesota." The volume contains the constitution and by-laws, a list of officers and members, in addition to the transactions for the third year of its existence. The proceedings are supplemented by papers read before the association at its meetings in December, 1883; April 1, 1884; September 2, 1884; November 3, 1884; December 2, 1884, and January 6, 1885.

BARBER & ROSS, No. 1014 Pennsylvania avenue, N. W., Washington, D. C., have sent us a copy of Volume 10 of their descriptive catalogue of building material. The book is a large octavo of 140 pages, bound in stiff covers and profusely illustrated. This firm are agents for the Conway Mfg. Co.'s hardwood mantels; the New York Wood Working Company's square turned balustrades and newels; the Henry F. Belcher mosaic glass; P. & F. Corbin's locks and bronze hardware; Bardsley Bros., wood door knobs, and Valentine's felt weather strip. More or less designs pertaining to each of these several lines of goods are included in the catalogue, together with many others. Among the illustrations presented are front and vestibule doors, interior doors, inside shutters, kitchen dressers, cornices, church windows, a large selection of wood moldings, gable finish, cornice and porch brackets, wooden fences and fence material, bank counters, dormer windows, balusters, newels, stair rails, mosaic glass, hardwood mantels, hinges, locks and various articles of fine hardware. Near the close of the book rules for ordering goods are presented, also a list of articles necessary for house building, and a catalogue of articles which this firm have for sale, arranged in alphabetical order. The firm make a business of supplying contractors and builders, and furnish goods in such quantities—and, in the case of materials requiring the same, cut to such sizes—as may be required. A few designs of buildings are presented at the close of the book, and also a copy of the building regulations of the District of Columbia.

BUTLER & CONSTANT, of No. 18 Warren street, New York City, have recently issued a very elaborate catalogue of builders' hardware. The book is both longer and wider than the ordinary octavo volumes put out by manufacturers and dealers, and contains nearly 200 pages. The goods illustrated and described comprise many of the articles that enter into building construction, preference being given always to first-class goods and those of the greatest utility. The illustrations, which are of excellent quality, are for the most part full size, and show the goods in so thorough a manner as to make selection by means of the catalogue almost as satisfactory as though the goods themselves were examined in a store. A prominent feature is the varied assortment. The purchaser in almost all cases has the choice of several different articles adapted to any given purpose. For example, in sash fasteners no less than five leading styles are presented. The same remarks will apply to door hangers and to various other goods illustrated. The assortment of locks is especially complete, and many designs of fine bronze hardware are presented. From the preface we learn that in addition to the goods described in this volume the firm carry in stock a complete line of builders' and miscellaneous hardware. They are prepared to make estimates for all classes of public and private buildings on application. Prices are omitted throughout the volume, but are supplied to intending purchasers upon application. The book is one of the finest that has been issued for circulation among contractors and builders.

IN ANOTHER COLUMN in this issue we illustrate the "Johnson" portable automatic fire escape, manufactured by the Warren Fire Escape Company, of Warren, Ohio. The price on these goods is as follows: No. 1, 60 feet, $5 each; No. 2, 80 feet, $5.50 each, and No. 3, 100 feet, $6 each.

THE NEW YORK STONE CONTRACTING COMPANY, with offices 113 East 25th street, New York, have issued a very handsome pamphlet of some 70 pages illustrating the applications of beton construction under the Coignet and Goodridge patents. The engravings show systems of constructing and repairing railway and other structures. There are also included among the illustrations the drawings of the United States and Canada patents on which the systems shown are based. The manufacture of beton in this country was commenced as recently as 1869. The company who issue the present work have been prominent in this line of business in the interval, and the illustrations in this book show many structures which they have erected. A number of them have been up for a term of years, and have satisfactorily withstood all the tests to which they have been subjected. The work illustrated includes structures in different parts of the country, among which we notice tunnels for the New York, Ontario and Western Railroad, the celebrated cantilever bridge over the Niagara River, piers for the Kansas City bridge, tunnels under the Pennsylvania Railroad, the Portage bridge of the Erie Railroad, the Bergen tunnel of the same railroad, with work more or less ornamental in and about the parks in Brooklyn and New York.

THE PRICE LIST on the "Washburn" self-locking blind adjuster, illustrated in another column of this issue, is as follows:

Japanned.	Doz.	Gross.
10-inch bar, for frame houses.....	$2.50	$30.00
12-inch bar, for brick or frame houses.	3 00	36.00
14-inch bar, for brick or frame houses.	3.50	42.00
16-inch bar, for brick or frame houses.	3.85	46.00
18-inch bar, for brick or frame houses.	4.20	50.00

Packed in wood boxes, with screws.

Galvanized.	Doz.	Gross.
10-inch bar, for frame houses.....	$3.35	$40.00
12-inch bar, for brick or frame houses.	3.85	46.00
14-inch bar, for brick or frame houses.	4.35	52.00
16-inch bar, for brick or frame houses.	4.70	56.00
18-inch bar, for brick or frame houses.	5.00	60.00

Packed in wood boxes, with screws.

THE NARRAGANSETT MACHINE COMPANY, of Providence, R. I., in directing attention to the foot-power circular saw which was illustrated in this journal last month, dwell specially upon the feature of raising and lowering the saw, which is accomplished in such a manner as to keep the table stationery. Our engraving shows how this is accomplished, although in our description we did not mention it specially. The machine embodies many excellent as well as novel features, and, we understand from the makers, is finding favor with numerous builders and contractors.

IN ANOTHER COLUMN of this issue Charles Wuichet & Co., of Dayton, Ohio, direct the special attention of builders to their facilities for the manufacture of galvanized-iron work of all descriptions. This firm are well equipped and for a long time have made a specialty of supplying builders. They call attention to special discounts made to builders, and invite applications for their catalogues, which are sent free.

CARPENTRY AND BUILDING

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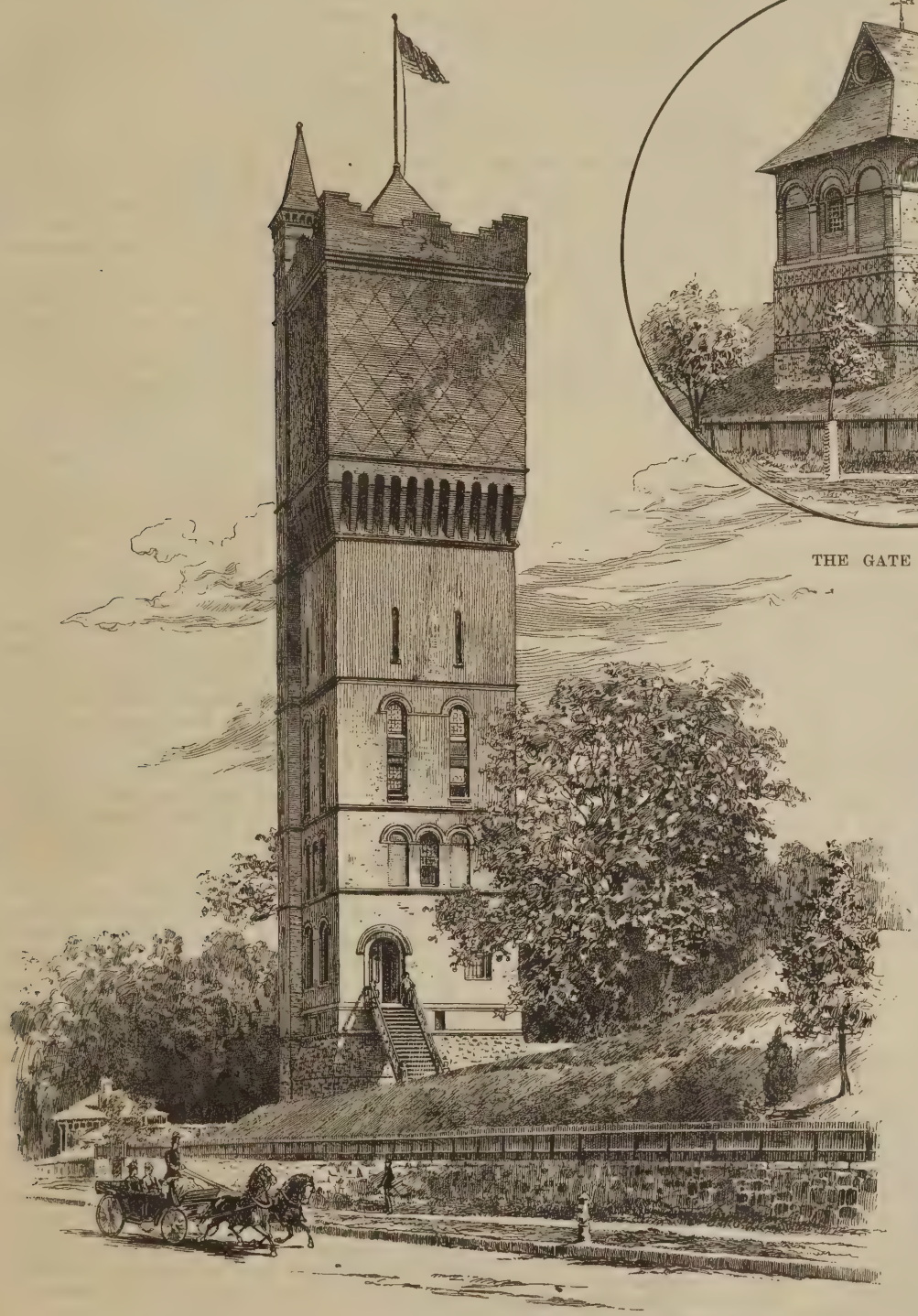
THE GATE HOUSE.

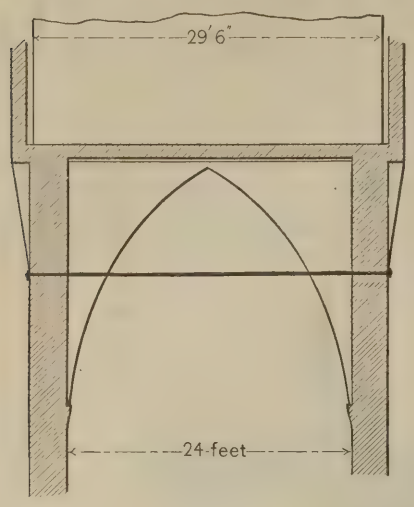


HIGH SERVICE TOWER OF THE HACKENSACK WATER COMPANY, AT UNION HILL, N. J.

AMONG the many conspicuous objects in the neighborhood of New York City is the High Service Tower of the Hackensack Water Company. It is so situated as to be seen from all the ferries plying between the city and the Jersey shore, and also from the decks of excursion boats running on the Hudson and about the Bay. The top of the tower projects far above the surrounding trees, and its bright red is in marked contrast with the green of the foliage. The water works of which it is a part are located a short distance above the city of Hoboken, on the west bank of the Hudson River. The hill on which they are built rises about 150 feet above sea level, and is but a short distance south of that wall of trap-rock known as the Palisades, being, in fact, a continuation of the same hills. The tower is 35 feet square at the base, and 152 feet high to the top of the brickwork. It is square in plan, with turret built out at one corner rising the entire hight of the building and ending in a pinnacle at the top. The object of the tower, as our title indicates, is that of obtaining a greater head to the water supplied to portions of the district depending upon these works than is afforded by the reservoir, near one corner of which the tower is situated. A tank of large capacity is located in the upper part of the tower, while in lower portions are the pumping engines for elevating the water, the boiler for supplying steam to the engines and the office of the engineer in charge. The walls of the tower are 3 feet in thickness up to the floor of the tank-room; there the size of the tower is enlarged, so that the tank may be supported directly by the walls. It is also supported by a series of arches which occupy the whole of what we may term the fifth story, or the space immediately below the tank. The arches, of which there are eight, spring from a line about 6 feet above the floor of this story, and are strengthened by horizontal tie-rods. They are 12 inches thick, forming a solid spandrel. At the top adjacent arches are connected by other shallow arches sprung in the opposite direction, and the hollows are filled with brick and afterward covered with cement, so as to form a level flooring for the tank to rest on.

The tank-room is 30 feet 9 inches square and has walls 12 inches thick, supported by corbels, as shown in the general view. The tank is cylindrical in form, 29 feet 6 inches

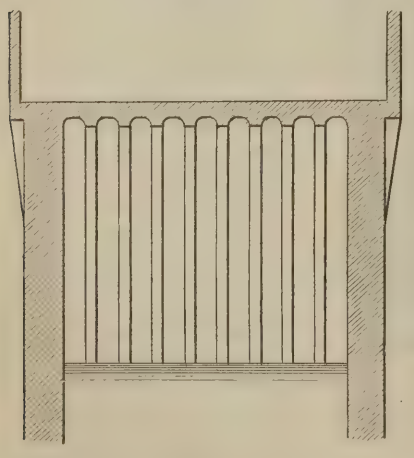
in diameter, and 31 feet deep, and built of heavy boiler iron. Its capacity is between 150,000 and 160,000 gallons. The water is not pumped directly into the tank, but is forced into the supply mains, an up-



High Service Tower of the Hackensack Water Company.—Vertical Section of Tower Between Arches Supporting Tank.

right pipe conveying the overflow to the tank. By this means the pressure is kept as constant as if the water were taken direct from the reservoir. The tower supplies Union Hill and West Hoboken, the city of Hoboken itself taking water direct from the reservoir, which is sufficiently elevated to give the necessary head. The reservoir is built of brick, on a rock-bed, and is surrounded by an earth embankment, one corner of which is shown in the illustration. It has a storage capacity of 15,000,000 gallons. The source of supply is the Hackensack River, at the town of New Milford, N. J., some 14 miles distant. From this point the water is pumped directly into the main that supplies the reservoir, there being a pumping station at that place for the purpose.

Inside of the corner turret of the tower already mentioned there is a spiral iron staircase which serves as the means of communication from one story to another. The boilers, three in number, are in the basement of the tower. The first floor is used as the engine-room, and contains a pair of Worthington duplex compound pumping engines. The high and low pressure cylinders of the engines are 14½ and 24½ inches respectively, and the stroke 18 inches. The capacity of the engines is 2,000,000 gallons each 24 hours, pumped from the reservoir into the tank at the top of the tower. The second story of the tower is used for the of-



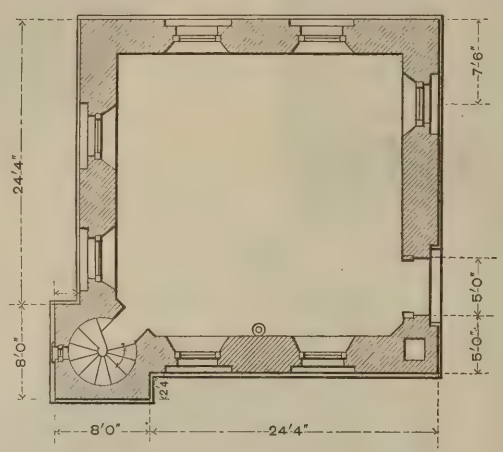
Vertical Cross-Section Through Center of Arches.

fice, while the third and fourth contain living-rooms. The tower is covered with a pyramidal roof surrounded by a rampart, as shown.

The design, which was prepared by F. C. Withers, architect, of New York, is well suited to the place, as is likewise that of the gate house of the reservoir. As we have before mentioned, the tower occupies a commanding site, and is a prominent landmark for many miles around. The system of the water works of which it is a part is one which it is frequently advantageous to employ, and therefore the description is of interest to architects and engineers, as well as to builders and contractors engaged in this general line of work. The engineer of the works illustrated was C. B. Brush, of No. 13 Newark street, Hoboken, N. J.

Supply of Building Stone.

In discussing the future of the building-stone industry, George P. Merrill asserts that of the future of this business little that is definite can be said. As the population increases and becomes more fixed in its abode there naturally arises a demand for a more durable building material than wood, which is still largely used in the country towns and smaller cities. As wealth accumulates, too, better and more substantial buildings are erected, which are often profusely embellished with the finer grades of ornamental stones. The demand, then, is sure to increase. In regard to the amount of the supply there can be no question; everything would seem to depend on the quality, variety and cost of working of yet to be discovered material. Are we to continue to import as now the finer grades of our ornamental stones, or will our own quarries—yet, perhaps, to be opened—pro-



Plan of Tower Through Engine-Room.

duce enough and more than enough for our own use?

In many of the Eastern and earliest to be settled States very little is yet known regarding their final resources. In Maine, for instance, fully one-half of the State is as yet an unknown land. Its present quarries are nearly all immediately upon the coast. What the resources of its immense interior are cannot with certainty be foretold. In the Southern and Western States and Territories this condition of affairs is naturally greatly magnified. The Virginias, North and South Carolina and Georgia all contain excellent material, none of which is now in our principal markets. Michigan can furnish brown sandstones in great abundance fully equal to any now quarried in the more Eastern States, and other sandstones of a beautiful mellow tint are known to occur in Western Arizona. The Rocky Mountain region contains an abundance, both in variety and quantity, of granites, sandstones, marbles and the more recent volcanic rocks, as basalts, rhyolites and trachytes. Some of these are very beautiful, excelling anything in this respect from the Eastern States.

The Future of Painting.

In a recent issue of an exchange there appeared an article discussing the future of painting, in which several ideas are advanced that differ from what is ordinarily accepted as the law and gospel of color. We append the article in full:

An eminent manufacturer of stained glass, who has made a lifetime study of the relations of color, remarked to us the other day that we are on the border-land of modifications of color; that current theories which for the past generation or two have have been accepted, with the effect of restricting artistic effort, are being rapidly cast aside. He pointed out that schemes of color, or rather of the principles of combination which are set forth with much erudition in old works, are being looked up, their bearing on the relations of color to geometry or form and even to sound, and that within the past few months treatises on color of a practical character have appeared abroad that have attracted wide attention, indicating scientific lines for new departures in chromatic decoration. All advances in art have been realized by combining the old with the new, of resolving facts obtained by labored investigation under some higher principle. We cannot always trace the influences which conspire to bring about change, but it is certain that the public instinct has rebelled against the monotonous conventional styles that prevailed in color patterns, whether in wall-painting or wall-paper, as well as against the expressionless hues affected on the color of interior architectural features. The mass of persons are not willing to forego the pleasure of bright and cheerful hues, and bold but happy combinations. If more skill is required, that skill, we may be sure, will be forthcoming.

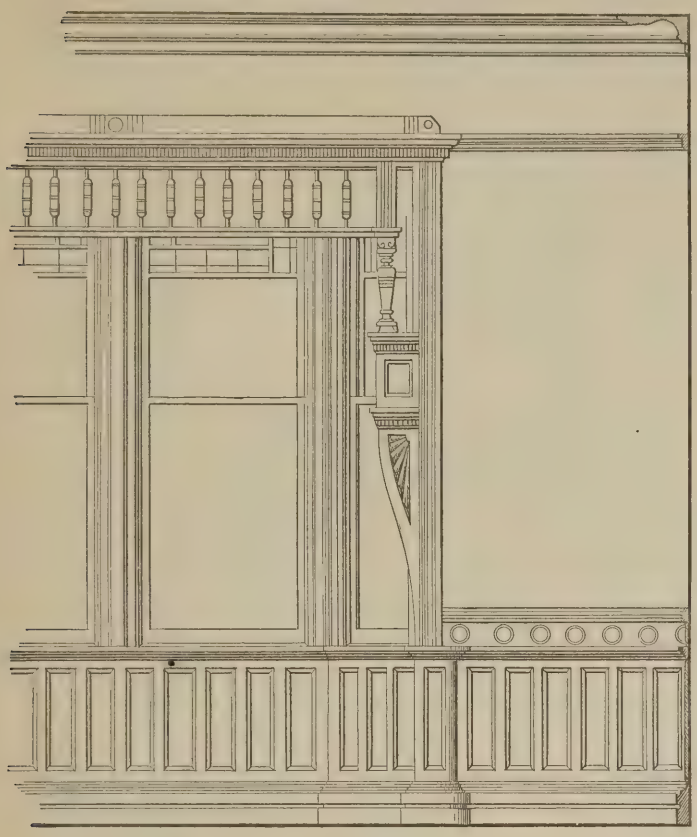
Some of the best effects in house coloring in this and in other cities have been devised by amateurs who had applied the laws of optics to harmonious coloring without reference to current opinions held or to general practice. They owe their success to the recognition of certain general principles applicable to colors generally, under whatever circumstance they are presented to the eye. An eminent critic has remarked that "the organs of sight are equally susceptible of pain or pleasure with those of hearing and taste, from the degree and mode of irritation produced upon them, and that colors, like sounds and flavors, are rendered more pleasing by being harmoniously mixed and graduated than when distinct and uniform. Color, when arranged according to optical laws, must be a quality of visible beauty more easily recognized than even symmetry of form, and must be equally agreeable to all, according to the correctness and sensibility of their organs of sight, termed accidental colors, and the introduction of which, in connection with the colors to which they pertain, lies at the foundation of all productions of established excellence in the way of painting or color design. If any color placed on a white or black ground be gazed on steadily for a short time, it will appear to be surrounded by a border of another color of the same hue. This is the accidental color, which must accompany that gazed at, like the satellite of a planet, and which augments the shade without reference to taste."

The same principles apply to house painting or house-color decoration, which are illustrated in the most splendid achievements of the past, whether on stone or canvas. The rule to be followed is to supply those colors and in those proportions and combinations which give pleasure and delight. In the future of painting we look for the abandonment of feeble monotony for the vigorous rendering of well conceived and successful schemes of color, of results not reached by chance, but absolutely insured by consulting the true conditions by which pleasure is afforded to the vision.

In some tests made with small squares of various woods buried 1 inch in the ground, the following results, says the *Garden*, were noted: Birch and aspen decayed in three years, willow and horse chestnut in four years, maple and red beech in five years; elm, ash, hornbeam and Lombardy poplar in seven years; oak, Scotch fir, Weymouth pine and silver fir decayed to a depth of ½ inch in seven years; larch, juniper and arbor-vitæ were uninjured at the expiration of the seven years.

Dining-Room Finish.

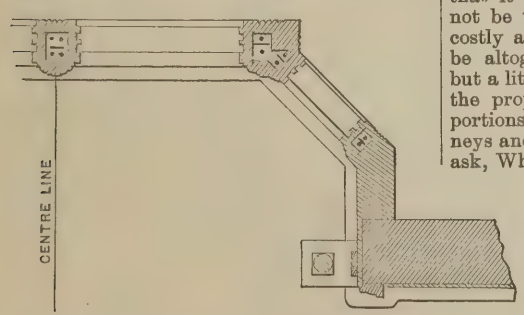
We lay before our readers on this and the two pages following a study in dining-room finish by Mr. A. M. Stuckert, of Newark, N. J., and which received one of the prizes in our third competition. In the floor plan there is shown the general arrangement of the house of which this dining-room is supposed to be a part. One of the elevations shows the finish of the end of the room, including the bay window, which is a prominent feature, while the other shows the finish of the side, including the mantelpiece. The details have been carefully considered, and as presented clearly show the idea of the designer in every part.



Study in Dining-Room Finish.—Half Elevation of End.—Scale, ⅜ Inch to the Foot.

Chimneys.

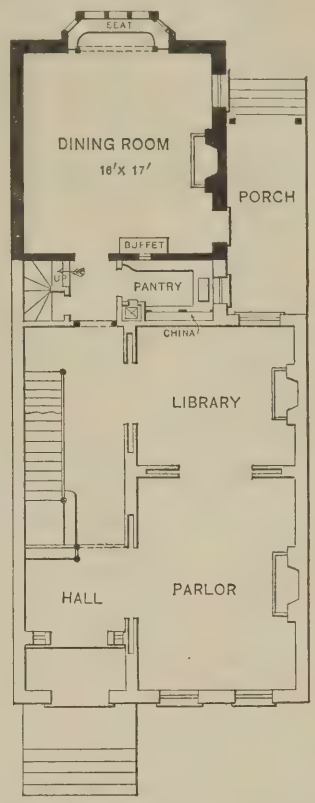
Several paragraphs have been published recently on the general subject of chimney construction, but none of them have given as careful attention to the topic as a paper read at the conference of architects at the recent International Health Exhibition, by John P. Seddon. The subject is necessarily considered from an English standpoint, but the conditions in England and in various sections of our own country are not so unlike as to cause the paper to be devoid of interest or value to American readers on that account. Accordingly we present it in full as it appears in one of our English exchanges:



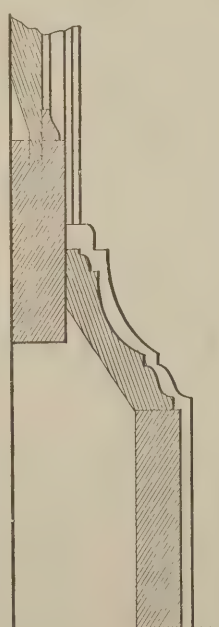
Half Plan of Bay.—Scale, ⅜ Inch to the Foot.

Chimneys, at present at any rate, are integral and important features of ordinary buildings in England. It may be that they can and will ultimately be altogether dispensed with, and our towns made, by the progress of economic science, to resemble those in the East—mere collection of flat-roofed boxes; and these may possibly be fed with fresh air of varied temperature, and drained of their fouled air, by some parish pump and common heating apparatus. When this scientific millennium arrives such dwelling may be left to purely scientific men, to whom æsthetic considerations are questions of superfluity. I have, however, now to speak as an architect, addressing a sanitary conference, upon chimneys as existent, and I wish to show how they can and should be treated, that they may be practically useful and ornamental as well. They have been both in former times; witness the graceful chimney shafts of Grosmont Castle, Southwell Priory, Hampton Court, and a host of Elizabethan mansions, the acknowledged picturesqueness of which is mainly due to the treatment of their chimney stacks. Alas, however, they are seldom either useful or ornamental nowadays, as a glance at the sky line of our streets will reveal, since they are almost invariably disfigured by ugly cowls and "tallboys." These are but records of domestic misery and discomfort, every one representing a martyrdom, endured until it became intolerable; and their aggregate cost amounts to a tax upon the inhabitants of our cities which, were it an enforced one, might lead to a revolution. Yet the makers of such monstrosities occupy no inconsiderable space in this very Health Exhibition, and recommend their wares as palliatives for a disease which they assume to be not only universal, but inevitable. I maintain that it is not the latter, and need not be the former, and that such costly and ugly excrescences may be altogether dispensed with if but a little attention be given to the proper construction of these portions of our buildings—chimneys and fireplaces. Now, let me ask, Why do our chimneys smoke?

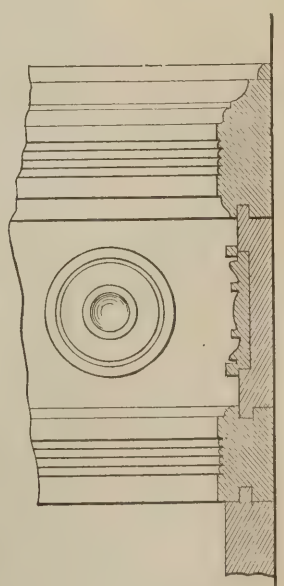
First, because, as a rule, air is not laid on or provided to houses, as water is; but rather, indeed, it is in general sedulously excluded. The more sanitarily impervious (that is to say, air-tight) we make our dwellings, the more necessary it is to provide for the admission of fresh air to their interiors, and unless this be done smoke cannot ascend the flues of their chimneys; second, chimneys smoke because the fireplaces are ill-constructed and gathered over from the openings of the fireplaces to the flues in such a gradual manner as to leave large vacant spaces above the grates, which act as reservoirs for stagnant cold air, by contact with which the smoke is chilled and prevented from rising and being drawn at once into the flues; third, chimneys smoke because flues are ordinarily made too large (the usual size is 14 x 9 inches); they should rarely be made more than 9 x 9 inches); fourth, because no provision is made in the flues for such down drafts of air as may invade them to expend and exhaust themselves before they reach the fireplace; and, fifth, because the tops of the chimney shafts are not carefully constructed with guards against wind in a proper and sightly—that is to say, an architectural—manner. Usually all such provision is left to be supplemented by some miserable metal makeshifts, by the chimney quacks whose fantastic creations Dickens satirized so keenly, and yet, as it would appear even from this exhibition, quite vainly.



Plan of Floor of Which the Dining-Room is a Part.—Scale, $\frac{1}{16}$ Inch to the Foot.



Base Board.—Scale, 1½ Inches to the Foot.



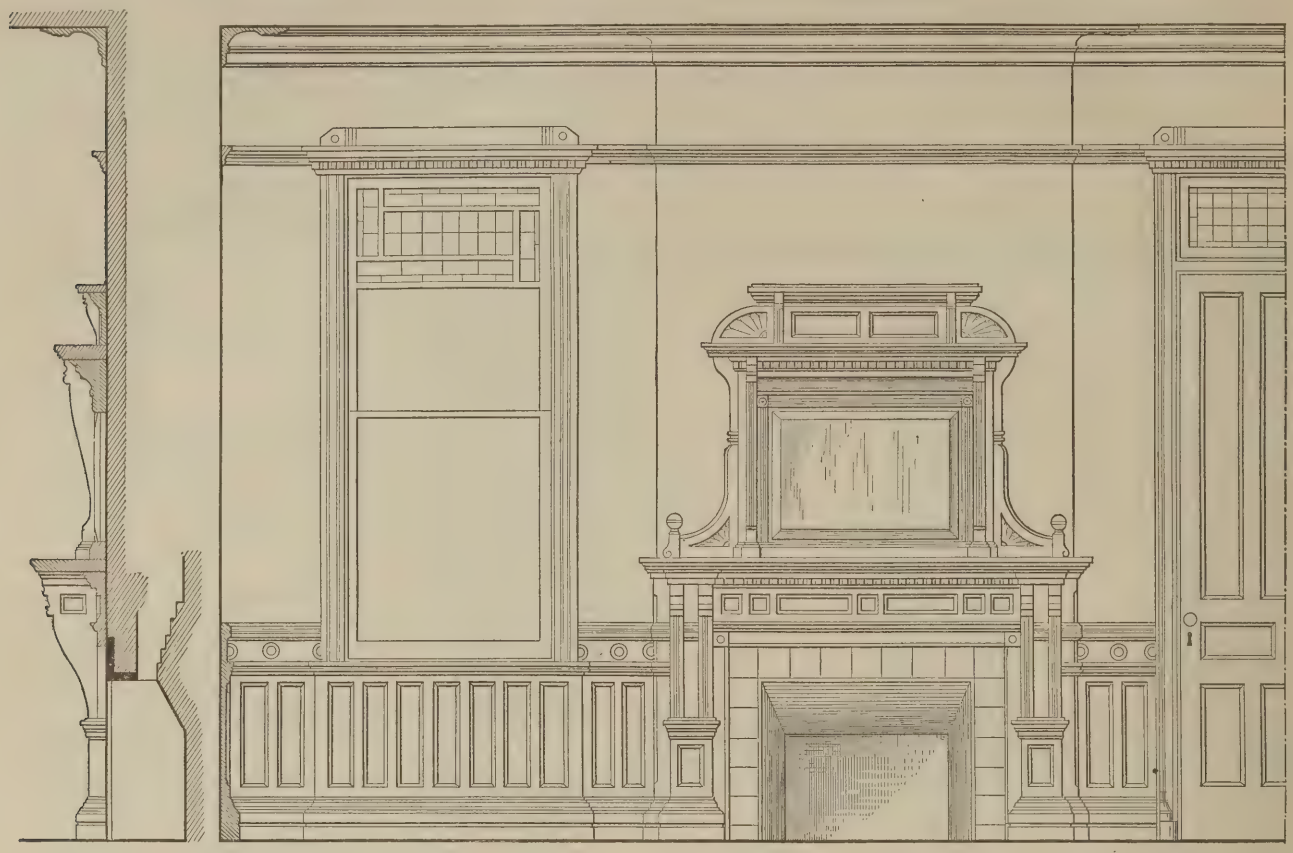
Wainscoting.—Scale, 1½ Inches to the Foot.

As it is useless to expect that chimneys

can properly perform their office, of conducting readily into the outer atmosphere

ranged, yet not from the top of the chimney stack, lest smoke from other flues be

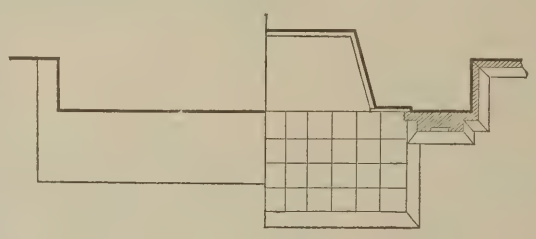
jectionable space for cold air. Now, arch and chimney-bar may be economically dis-



Study in Dining-Room Finish.—Elevation of Side of Room and Section Through Mantel.—Sca'e, ⅜ Inch to the Foot.

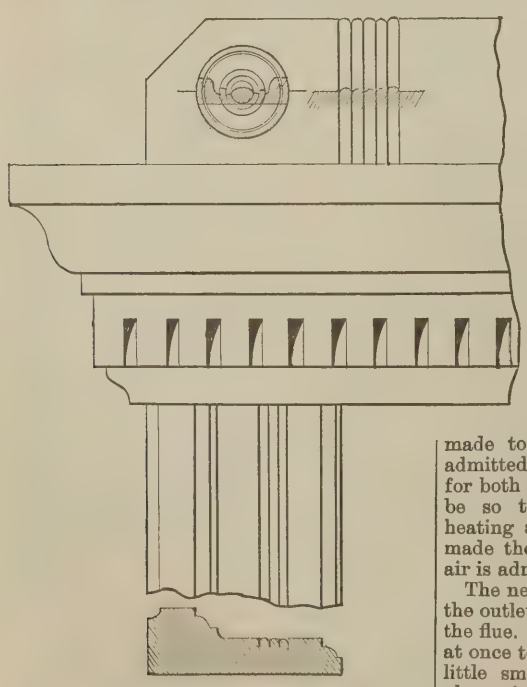
the smoke from fireplaces unless their construction is proper throughout, I shall treat of the fireplace, flue and chimney-top as a whole, of which the several parts are inseparably connected; and I shall begin at the bottom with the fireplace, as the most important of the three, and the one most commonly in fault in the case of smoking chimneys, although it is generally the last to be noticed or examined with a view to its correction. The grate itself, however, I shall leave for later consideration, though it is by no means of the least importance. The first thing to be done is to provide a good and sufficient supply of fresh air to the fireplace from the outside of the building. To insure its being good it is well, when possible, to bring this from as high a level as can be ar-

drawn down thence with the fresh air. It may be drawn from the lower part of the stack, just above the roof, by special air flues brought down the chimney jambs. This, however, is not always possible, and then it must be brought in through the walls or by pipes through the floors. An advantage of bringing the fresh air to the fireplace rather than to any other part of an apartment is that, even if cold, it does not produce the inconvenient drafts usually complained of. It spreads thence upward and gradually before being finally drawn up the chimney by the fire in the fireplace, whereas, if admitted elsewhere, its passage is direct to the fire, and unpleasantly so to those who may intercept its course. When no provision for air is made it has to force its way in at windows and doors, with the same result, made all the worse because of the low temperature at which it enters. The air, however, brought to this point may be tempered or warmed by being made to pass round the grate before it is admitted to the apartment, and an essential for both comfort and health is that it should be so tempered; every grate, stove or heating apparatus should, in fact, be thus made the fountain or source whence fresh air is admitted to apartments.

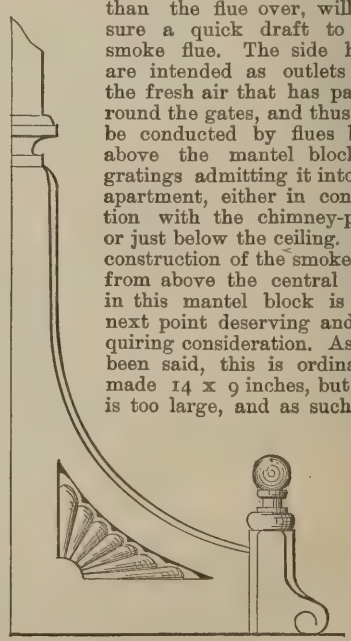


Half Plan of Shelf and Hearth.–Scale, ⅜ Inch to Foot.

The next point to be considered is that of the outlet of the smoke from the fireplace to the flue. The flue should be here contracted at once to its normal size, or rather made a little smaller, immediately above the fireplace, in order to promote a quick draft of the smoke into it. The usual construction of this part of chimneys, already adverted to, does not conduce to this end. The opening of the fireplace is gathered gradually, in an arched form, to the flue, leaving an objectionable space for cold air. Now, arch and chimney-bar may be economically dispensed with by forming a mantel block in Portland cement concrete *in situ*, extending the full width of wall and 9 inches longer than the opening, and 9 or 12 inches deep, pierced with the smoke flue in the center, and one for warmed air on either side. These may be circular, and about 8 inches in diameter, and thus, being slightly smaller than the flue over, will insure a quick draft to the smoke flue. The side holes are intended as outlets for the fresh air that has passed round the gates, and thus can be conducted by flues built above the mantel block to gratings admitting it into the apartment, either in connection with the chimney-piece or just below the ceiling. The construction of the smoke flue from above the central hole in this mantel block is the next point deserving and requiring consideration. As has been said, this is ordinarily made 14 x 9 inches, but this is too large, and as such becomes a frequent cause for smoking chimneys. Flues should not generally be made more than 9 x 9 inches in brickwork, and are

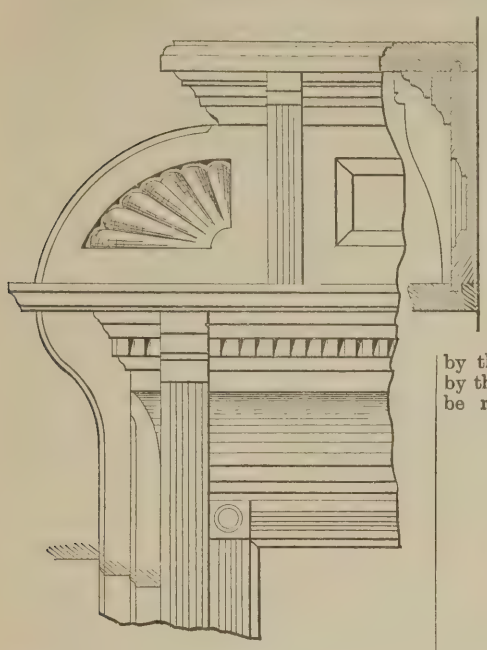


Detail of Window and Door Trimming.—Scale, 1½ Inches to the Foot.



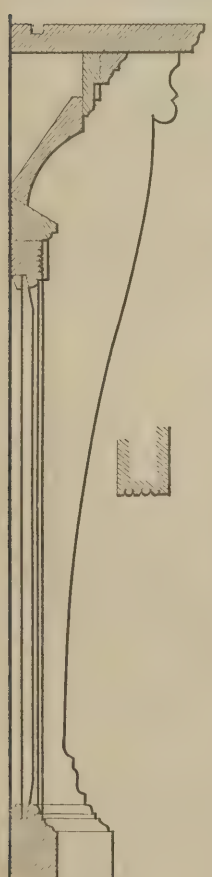
Bracket at Side of Over-Mantel.—Scale, 1½ Inches to the Foot.

better if lined with fire clay pipes within such which reduces them to about 8 inches in clear circular diameter. The interior surfaces of the pipes should not be smooth, or else much



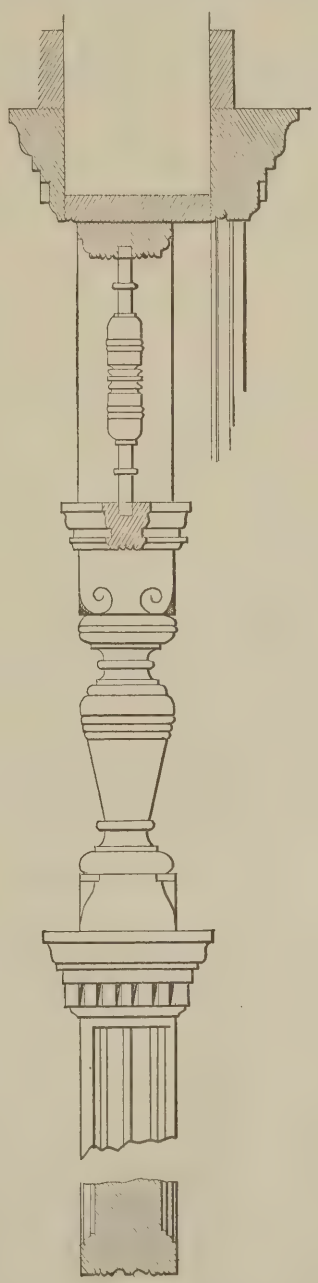
Study in Dining-Room Finish.—Top of Over-Mantel.—Scale, 1½ Inches to the Foot.

inconvenience will be caused by frequent small falls of soot, from its being unable to cling to the pipes at all. Midway between the top of the mantel block and the ceiling line of the apartment the smoke flue should have a portion expanded and formed in such a manner as to break the direct line of ascent of the smoke. This is in order to allow down drafts or gusts of air that have invaded the flues from the top to expend themselves without checking the smoke as it rises from the fireplace. A flat ledge should be provided in this expanded part of the flue, immediately under the smoke flue above, that air driven down may impinge upon it and be diverted, and a sideways rotary motion given to it, directing it upward again, together with the smoke rising from below. Specially-formed pipes can be introduced into flues lined with fire-clay pipes for this purpose, and more than one of these may be inserted in the course of the flues with advantage. We now have arrived at the chimney stack above the roofs, and the principal object in its construction is to maintain throughout its warmth, as it is there, of course, exposed to the cold and damp; and it is well known and observed that those chimneys which are in external walls are from this cause far more liable than others to smoke. Pervious brickwork becomes saturated by rain, and the flues consequently reduced in temperature are unable to maintain the requisite upward draft. It is well, therefore, for this reason, as well as for additional strength, that the chimney stacks above the roof should be built in cement instead of common mortar, and of impervious bricks or stone and lined with fire-clay pipes.



Pilaster of Over-Mantel.—Scale, 1½ Inches to the Foot.

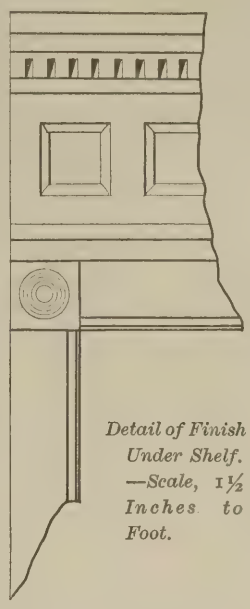
The tops of the chimney stacks need careful arrangement, because the exit of the smoke from them is very liable to be disturbed and hindered by gusts of wind, particularly when beneath other high objects in the neighborhood. There should, therefore, be at the top of every flue an expanded space, within which most down drafts of air will rotate and expend their force without invading the flue below; and there should be louvred openings so arranged as to direct the wind upward, and so make it to assist, instead of interfering with or retarding, the exit of smoke. This is the object generally and often rightly attempted by the supplementary cowls, at any rate by the best of them, but it may and should be rather executed in proper architectural



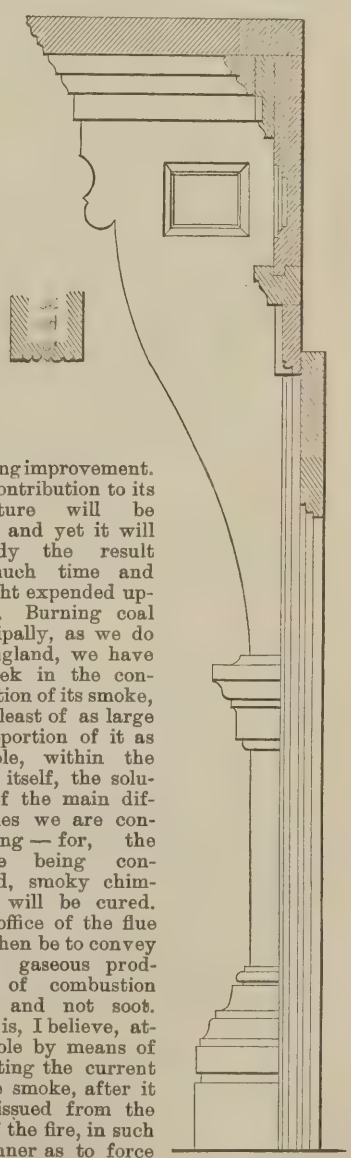
Finish of Arch in Bay Window.—Scale, 1½ Inches to the Foot.

form, and durable and sightly materials, such as stone, brickwork or terra-cotta, instead of metal. Terra-cotta is perhaps specially suitable, as being very easy manipulated into the somewhat complicated forms required for the purpose.

So much, then, for the construction of these three parts of a chimney—the fireplace, the flue and the chimney terminal of the stack. Unless all are well and properly executed, no special appliances for particular parts can be of much avail. I have endeavored to point out the general principles that I think should be attended to in connection with them, and, believing that the health and comfort of the community is at present very injuriously affected by their general neglect, I earnestly commend them to the consideration of this conference. There is, however, one more part connected with the chimney which is perhaps quite as important as any of the rest with which I have dealt, but what I have to say about it is somewhat more tentative and experimental. This is the grate within the fireplace. Volumes have been written about it, and yet it remains open for discussion and



Detail of Finish Under Shelf.—Scale, 1½ Inches to Foot.



Side of Mantel Pilaster.—Scale, 1½ Inches to the Foot.

inviting improvement. My contribution to its literature will be short, and yet it will embody the result of much time and thought expended upon it. Burning coal principally, as we do in England, we have to seek in the consumption of its smoke, or at least of as large a proportion of it as possible, within the grate itself, the solution of the main difficulties we are considering — for, the smoke being consumed, smoky chimneys will be cured. The office of the flue will then be to convey away gaseous products of combustion only, and not soot. This is, I believe, attainable by means of diverting the current of the smoke, after it has issued from the top of the fire, in such a manner as to force it to pass through the body of the fire before it ultimately is allowed to escape up the chimney flue. Perfect combustion is, I think, more to be sought than what is called "slow combustion," and it is a mistake, in my opinion, to smother a fire in its own ashes by preventing their

dripping through a grating into an ash-pan. The cheerful aspect of an English open fire is not likely to be driven out of fashion by even health exhibitions; nor if it could be, and the attempt were made, do I think that the public salubrity would be improved by the substitution of any description of close stoves in apartments, notwithstanding the preference they have obtained on the Continent, and to a great extent in America. Nor do I believe that any of the systems that have been proposed for keeping up throughout dwellings an equable temperature are likely long to curtail the liberty of English subjects to make their several rooms of whatever degree of heat it may please their occupants. I should certainly, therefore, not advise the most ardent believer in such a system to expend capital in building houses otherwise than at present, or to try to dispense with chimneys, the construction of which I have been dealing with.

But there are many grates shown in this exhibition which presume fresh air to be brought to them, and in which means are provided for warming and distributing such air into apartments, and I cannot too highly commend the system and advise its universal adoption by the public; and I may point out that this can and should be done, more often than it is, in the case of the kitchen chimney, which is almost always in use, and that the air warmed thereby, not being wanted in the kitchen, should be conducted to the general hall of the house, which supplies air to the rooms whenever their doors are opened, though, of course, there should be means of shutting it off in summer, when it might prove rather a nuisance than otherwise. Trusting, then, that soon, if it be not already achieved by any of the grates shown in this exhibition, that most desirable end, the consumption of smoke within the grate itself, will be successfully carried out, I conclude these few observations upon the construction of chimneys, waiting discussion thereon from the members of this conference.

A new process of hardening plaster-of-paris, so that it may be used among other purposes for floor parqueting, is described by M. Julhe. It consists in mixing the plaster-of-paris before using for casting with one part in six of finely-sifted, recently-slaked lime, and saturating the well-dried casting with a solution of sulphate of a base giving an insoluble precipitate with lime. Sulphate of zinc and sulphate of iron are both suitable. The zinc sulphate gives a white material, while that containing iron is at first greenish, but upon drying takes the characteristic color of ferric oxide. A coating of burnt linseed oil converts this into a mahogany color, and a coat of copal varnish gives a fine surface. The casting should be well dried before treating it with the sulphate solution, and after being immersed not longer than two hours it should again be dried; it may then be replaced in the solution until the saturation is complete. It is said to resist atmospheric influences, and when sulphate of iron is used the resistance to fracture is said to be 20 times greater than in ordinary plaster.

Raising a Masonry Arch.

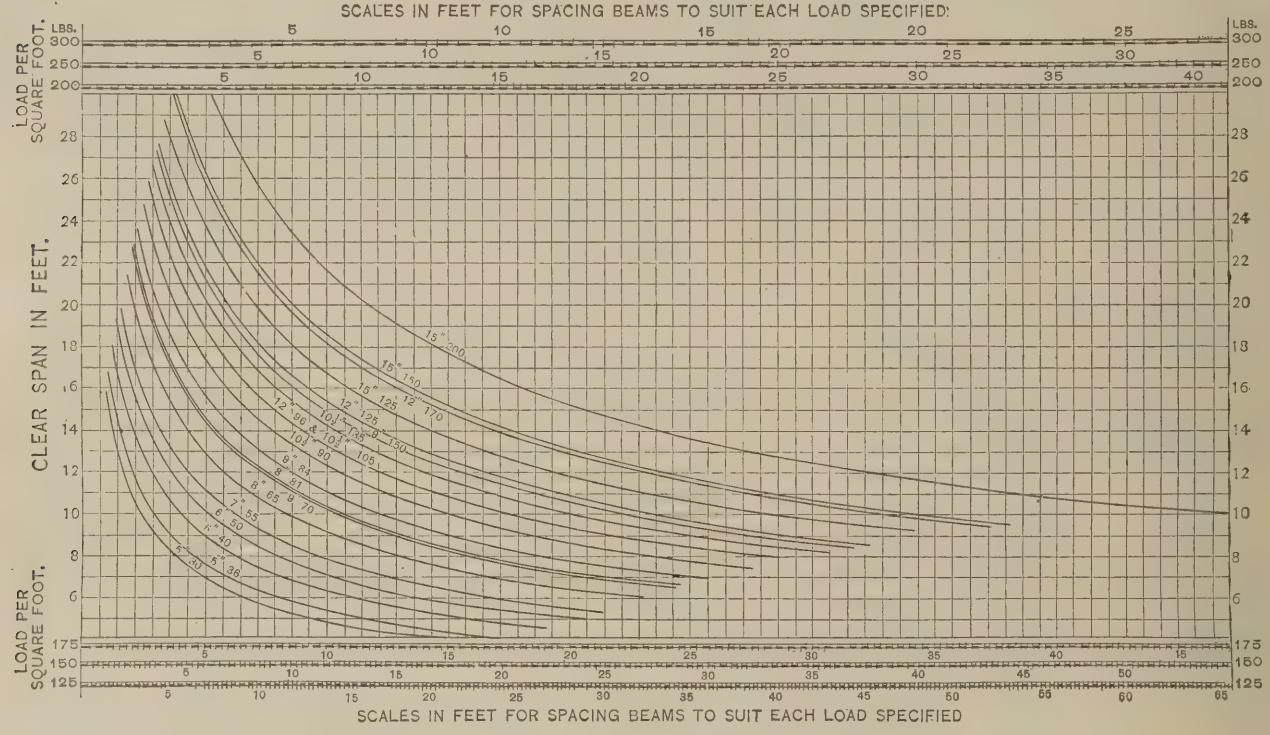
Les Annales des Traveaux Publics for July, 1885, describes the lifting to a more elevated position of a masonry arch having a span 32.8 feet and a rise of 4.26 feet. The arch was 15 feet wide, and at the key was 2.88 feet deep. A lining of plank was first put under the arch and then five centers made of wrought iron. Under each end of the arch were then placed two bents of timber 5.8 feet apart and well braced in both directions. Each of these bents rested on two longitudinal timbers, and between these sticks midway, between the centers, were located double wedges, and between each set of wedges and directly under the centers and their posts were lifting-screws. This arrangement having been carried out, the arch was cut at the springing lines with hammer and chisel, leaving, until all was ready, three points of support on each side. When the weight of the arch, 180 tons, was thrown entirely upon the centers, several cracks made their appearance, and the crown sank about 1½ inches. At the first turn of the screws, however, it was found that the cracks showed no signs of further increase, and the lifting was commenced with great uniformity. At each vertical inch of hoist the screws were stopped and the wedges tightly driven. The total distance raised was 1.4 feet, and this work was accomplished in 14 hours. During the lifting a further sinking of about ¾ inch took place, and the eight cracks extended from end to end of the arch. These cracks had a width of ⅜ inch, but they were lost in the interior of the masonry, without appearing on the extrados. These fissures were filled with a thin grout of one part Portland cement to one part of sand, and eight days were allowed for the setting of this cement before the centers were removed. When the arch rested on its new abutments a fresh hair crack appeared, but without doing any further damage.

Coffin's Diagrams for "Phœnix" Beams.

Mr. Amory Coffin, engineer of the Phœnix Iron Company, of Phœnixville, Pa., has recently prepared and copyrighted diagrams which we reproduce. The smaller diagram enables builders to ascertain promptly what "Phœnix" beam they are safe in selecting when the load per square foot is given, between the range of 125 and 300 pounds, when the clear span in feet is given and the spacing is known. Thus, for a load of 125 pounds per square foot, 5-foot spacing and 12-foot span, a 6-inch 50-pound beam would meet the requirement. Or, if the load, the span and the beam are given, the spacing may be rapidly ascertained. Thus, for example, with a 15-inch 150-pound beam and a 20-foot span, it would be necessary to space the beams 5 feet with a 300 pound load, 6 feet with a 250-pound load, 7½ feet with a 200-pound, 8½ feet with a 175-pound and 10 feet with a 150-pound load per square foot. Similarly, the load, the spacing, the hight and weight of beam being given, the diagram would serve to quickly show how great a span might be chosen.

The larger diagram, also by Mr. Coffin, for "Phœnix" beams shows the capacity of single beams loaded at the center and supported sideways, the full line showing for each beam the limit of the span beyond which the deflexion exceeds customary limits. Given the span in feet and the beams, the net center load can be promptly found. Thus, taking a 15-inch beam weighing 200 pounds, the beam could sustain without more than ordinary deflection on a span of 24 feet a center load of 8½ tons. The diagram will be useful, too, in another way. Given the clear span in feet and the center load, then the beam to be used can be found. For example, with a 15-foot span and a 5-ton center load, the weight would be borne by a 12-inch 96-pound or by a 10½-inch 105-pound beam.

Mr. Coffin states that it would not be advisable to use a single beam for the support of such loads as the diagrams indicate, as it is to be understood that lateral flexure of the beams should be provided for by the use of suitable bracing with tie-rods or by bolting the beams together in pairs with properly designed separators. When employed in floors with brick arches these serve as lateral stays, but if the floors are to be left open between the beams, as is customary in the ice-chamber floors of breweries or in the arrangement of floors for grain elevators, a substantial bridging between the beams must


SCALES IN FEET FOR SPACING BEAMS TO SUIT EACH LOAD SPECIFIED.
LOAD PER SQUARE FOOT.
LBS.
CLEAR SPAN IN FEET.
SCALES IN FEET FOR SPACING BEAMS TO SUIT EACH LOAD SPECIFIED

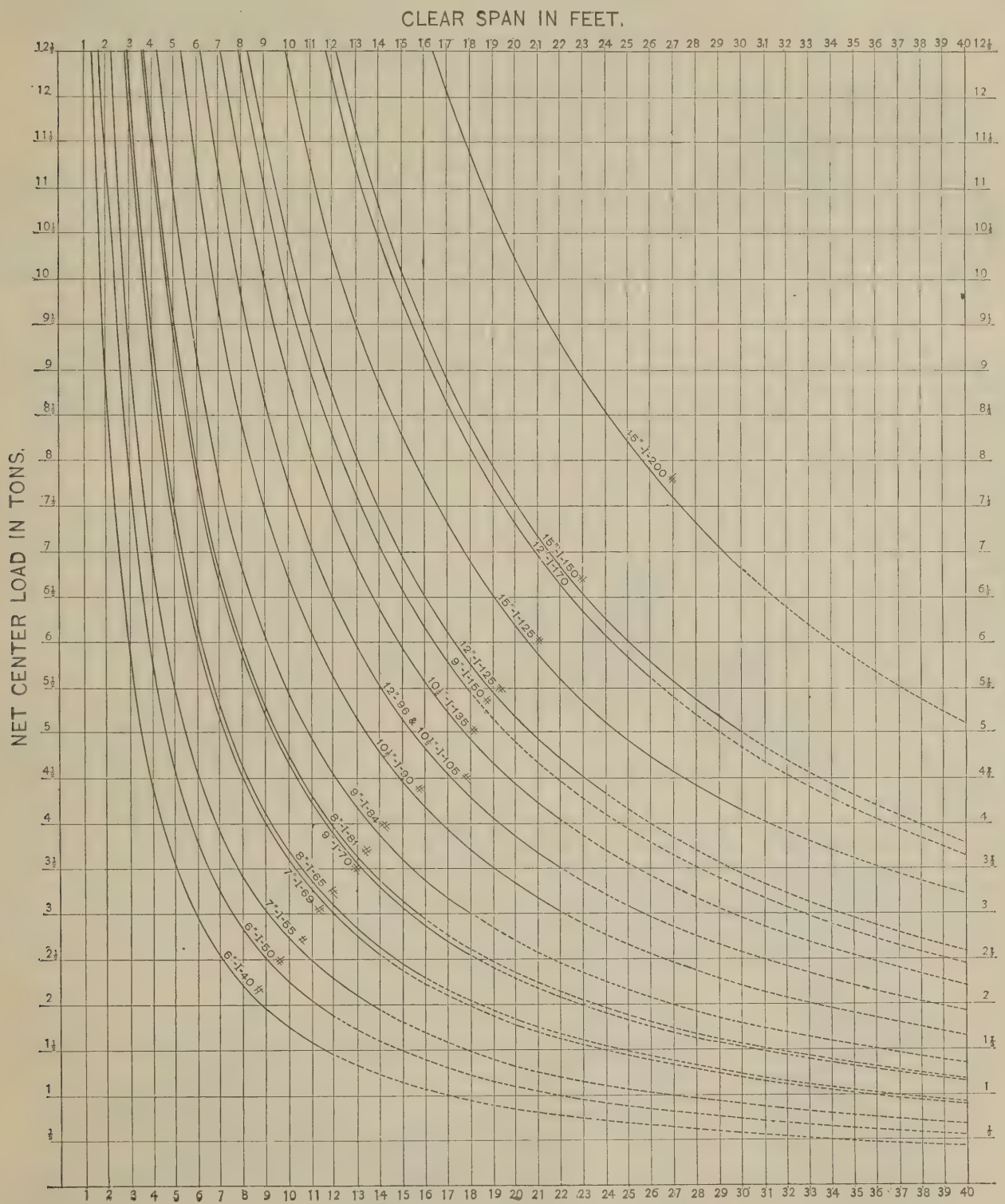
COFFIN'S DIAGRAMS FOR PHŒNIX BEAMS.

be added to prevent flexure sideways in order to insure its full duty from each beam.

Cherry Wood.

According to the *Northwestern Lumberman* the time is not far distant when good cherry timber will be as difficult to obtain as good walnut is at the present time. The cherry forests of Pennsylvania, undoubtedly the finest in the country, are nearly exhausted, and about all that is left in that State is held by a few large operators, who have advanced the price of the manufactured lumber to such a figure that in certain sections it has become a difficult matter to secure trade. In 1878 the demand for cherry lumber in the East began to increase, and it was the means of increasing the number of mills in the State mentioned. At that time stumpage cost nearly, if not quite, as much as at present, and the lumber sold at an average of $37 per 1000 feet at the mills for good, and the culls were considered worthless. As the demand increased, the manufacturers gradually advanced prices, and at the present time good first and second cherry is held at the Pennsylvania mills at $60 a thousand, while the general grade of the lumber is inferior to that sold seven years ago at $37. Cherry culls are sold to-day at from $10 to $15 a thousand, and the demand is increasing from the fact that numerous manufacturers of small wares are using cull cherry in preference to other woods. Within the past two years operators in certain parts of North Carolina have put up portable mills, and at great expense built roads up rugged mountain sides. As yet the venture has proved but fairly profitable, and it has not been possible to demonstrate the true worth of North Carolina cherry, from the fact that most of the timber so far obtained has been the smaller logs cut from the various tracts.

A curious feature of the cherry trade is the decrease in the demand East, and its increase in the West. Up to the present year the sale of cherry west of Ohio has been limited as compared with the East, but present indications point to a radical change in this feature. One Chicago hardwood dealer has recently contracted for 1,000,000 feet of Pennsylvania cherry, and still another has bought 500,000 feet from parties in North Carolina, in each instance paying not less than the prices before named. It is claimed by yard men in the East that with present trade there is no profit to be secured at such figures, and the result is that architects and builders have adopted other woods.



COFFIN'S DIAGRAMS FOR PHŒNIX BEAMS.

One of the most interesting features of the St. Louis Exposition, now in progress, is the display made by the St. Louis Manual Training School. In the two departments of drawing and shopwork both methods and results are shown. The general scheme of the school is that the pupils, who do about the usual amount of intellectual work, at the same time go through a course of manual training.

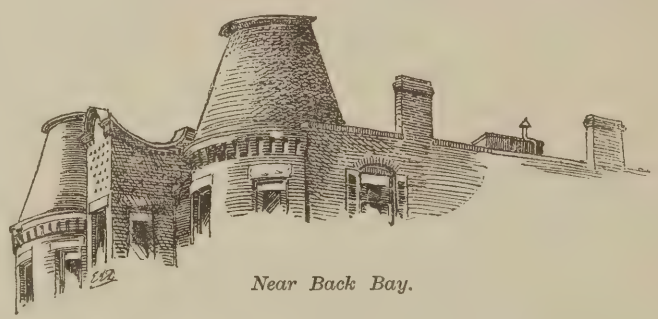
Crazy and Sham Roofs.

In a recent issue of the *American Architect and Building News* there appeared a number of cuts of roof designs, the originals of which are to be found in and near Boston. We have reproduced the engravings and submit them herewith for the consideration of all who have anything to do with roof designing or construction. It would seem that architects could go but little further in cutting up the roof lines of buildings.

Crazy and Sham Roofs In and Near Boston.—In Brookline.

The present fashions in architecture produce very unsatisfactory work for those who are engaged in the roofing business, and result in shapes of roof work that yield to the elements much sooner than those in which hips and valleys are less abundant. In many cases it appears as though leaks were actually invited, so faulty are the shapes that are produced.

At best the absurdities in roofs now so often to be observed are only in keeping with other features of modern building which some of the humorous writers have dubbed "crazy-quilt" architecture. The roofs here shown may be supposed to belong to houses of the general class described by "Bill Nye" in the following characteristic letter, which has had wide publication:



Near Back Bay.

"It may be premature, perhaps, but I desire to suggest to any one who may be contemplating the erection of a summer residence for me, as a slight testimonial of his high regard for my sterling worth and symmetrical escutcheon—a testimonial more suggestive of earnest admiration and warm personal friendship than of great intrinsic value,

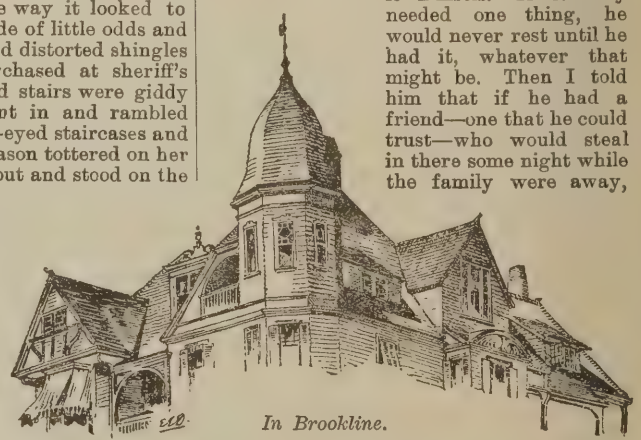
In Dorchester.

&c.—that I hope he will not construct it on the modern plan of mental hallucination and morbid *delirium tremens* peculiar to recent architecture. Of course a man ought not to look a gift house in the gable end, but if my friends don't know me any better than to build me a summer-house and throw in odd windows that nobody else wanted, and then daub it up with colors they have bought at auction and applied to the house after dark with a shotgun, I think it is time that we had a better understanding. Such a structure does not come within either of the three classes of Renaissance. It is neither Florentine, Roman nor Venetian. Any man can originate such a style of architecture if he will drink the right kind of whisky long enough, and then describe his feelings to an amanuensis. Imagine the sensation that one of these modern sawed-off cottages would create 100 years from now, if it should survive. But that is impossible. The only cheering feature of the whole matter is that these creatures of a disordered imagination must soon pass away, and the bright sunlight of hard horse-sense shine in through the shattered dormers and gables of gnawed-off architecture of the average summer resort. A friend of mine a few days ago showed me his new house with much pride. He asked me what I thought of it. I told him I liked it first rate. Then I went home and wept all night. It was my first falsehood.

"The house, taken as a whole, looked to me like a skating rink that had started out to make money, and then suddenly changed its mind and resolved to become a tannery. Then 10 feet higher it had lost all self-respect and blossomed into a full-blown drunk and disorderly, surrounded by the smoke-stack of a foundry, and with the bright future of 30 days ahead with the chain-gang. That is the way it looked to me. The roofs were made of little odds and ends of misfit rafters and distorted shingles that somebody had purchased at sheriff's sale, and the rooms and stairs were giddy in the extreme. I went in and rambled around among the cross-eyed staircases and other nightmares till reason tottered on her throne. Then I came out and stood on the architectural wart called the side porch, to get fresh air. This porch was painted a dull red, and it had wooden rosettes at the corners that looked like a brand-new carbuncle on the nose of a social wreck. Further up on the demoralized lumber pile I saw now and then places where the workman's mind had wandered and he had nailed on his clapboards wrong side up and then painted them with the paris green that he had intended to use on something else. It was an odd-looking structure, indeed. If my friend got all the material for nothing from people who had fragments of paint and lumber left over after they failed, and then if the workmen constructed it nights for mental relaxation and intellectual repose, without charge, of course the scheme was a financial success; but architecturally the house is a gross violation of the statutes in such cases made and provided, and against the peace and dignity of the State. There is a look of extreme poverty about the structure which a man might struggle for years to acquire and then fail. No one could look upon it without feeling a heart-ache for the man who built that house, and probably struggled on year after year, building a little of it at a time, as he could steal the lumber, getting a new workman each year, building a knob here and a protuberance there, putting in a three-cornered window at one point and a yellow tile or a wad of broken glass and other *débris* at another, patiently filling in around the ranch with any old rubbish that other people had got through with, and painting it as he went along, taking what was left in the bottom of the pot after his neighbors had painted their bobsleds or their tree boxes—little favors thankfully received—and then surmounting the whole pile with a *potpourri* of roof, a grand farewell incubus of bumps and hollows for the rain to wander through and seek out the different cells where the lunatics live who inhabit it. I did tell my friend of one thing that I thought would improve the looks of his house. He asked me eagerly what it could be. I said it would take a man of great courage to do it for him. He said he did not care for that. He would do it himself. If it only needed one thing, he would never rest until he had it, whatever that might be. Then I told him that if he had a friend—one that he could trust—who would steal in there some night while the family were away, and scratch a match on the leg of his breeches, or on the breeches of any other gentleman who happened to be present, and hold it where it would ignite the alleged house, and then remain there to see that the fire department did not meddle with it, he would confer a great favor on one who would cheerfully retaliate in kind at call."

In the Highlands.

In Brookline.



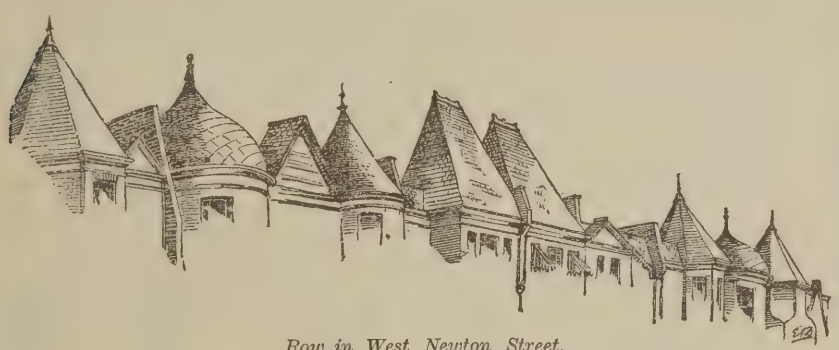
In Brookline.

We have no doubt all will enjoy this

somewhat unique discription of the modern house, written by one who possesses a keen sense of the ridiculous, wherever it occurs. It is scarcely possible to comment specifically upon all of these illustrations.

Crazy and Sham Roofs.—Near Back Bay.

The location of the buildings is approximately indicated in the captions which we have inserted, although the names of owners and architects are omitted. Each one may be said to contain a sermon in itself, together with a frightful example by way of application. Many of our readers have had their doubles for execution, and know how bad they are much better than we can describe. Our contemporary gives these roofs a very appropriate name. It characterizes them as either crazy or sham. For crazy roofs there certainly can be no excuse, and the principles of art are opposed to whatever is sham. It is to be hoped that such fashions as these, both in the interest of the building trades and in that of good architecture, will not long prevail.



Row in West Newton Street.

Brick-Making.

All who are acquainted with the building business about New York, or with New-York price lists of building materials, are familiar with Haverstraw brick. The section of the Hudson Valley known as Haverstraw furnishes a very large proportion of the brick consumed in and about New York City. A considerable number of brick-making firms are located in this region, and it may be said that they control the brick business for New York and neighboring cities. The original settlers who planted their homes under the shadow of the mountains at Haverstraw confined their energies to the soil, unmindful of the wealth beneath their feet. It was reserved for the English race to develop the business of brick-making which has made the town of Haverstraw and the region round about one of the most prosperous in the valley of the Hudson. Before the Revolution the few inhabitants had made small quantities of rough, unshapely bricks, merely enough for the chimneys of their homely dwellings. The first kiln of bricks for the regular market was not made until 1810, when a company from Philadelphia established a brick-yard on the bank of a creek which runs through the town of Haverstraw. This pioneer enterprise was a failure. It remained for the man whose skill laid the foundation for the wealth of this region to renew the business at a later day. We refer to James Wood who was a native of Colchester, England, and who came to this country in 1801. From his boyhood he had been engaged in brick-making, and a favorite expression of his was that brick-making was a poor man's business, for it required no capital with which to start. On his arrival in America he started his business at Sing Sing, but in 1815 he removed to Haverstraw, being attracted there not only by the vast deposits of clay, but also by the apparently unlimited supply of wood that was growing in the forests in the mountains near at hand.

In Dorchester.

From the time when the children of Israel labored in clay under the eyes of Egyptian taskmasters to the day that James Wood went to Haverstraw there was no important improvement in the business of brick-making. One day a sloop ran aground near Wood's brick-yard, and one of the crew, who had worked at the business in Tarrytown, showed him how to make a mold with a bottom and a "vent." Soon after this an Englishman of his acquaintance sent him a piece of anthracite coal as a curiosity. Placing a part of it on the fire he saw with surprise that it burned with intense heat, but without emitting the smoke which accompanies the burning of bituminous coal, and he remarked: "If that stuff will burn it will burn brick." Borrowing a mortar and pestle he pulverized a piece of the coal and mixed it with the clay for four brick, and, having marked them, placed them in the kiln with others. After the kiln was burned the four were examined, and a glance showed that his experiment was successful. He had made a great discovery, and from that moment the business of brick-making was revolutionized. Wood next placed the brick mixed with coal dust in the upper layers of the kiln, and found the result to be that they were burned as hard as the rest, a thing which had never happened before. Up to that time it had been impossible to make the bricks in a kiln of a uniform quality. They were always divided into "hard," "salmon" and "pale." The last were soft and useless for most purposes, but by the new discovery they were equally burned throughout. The advantages of this process were threefold: the bricks were not only uniform in value, but there was a great saving in time and fuel. It had previously taken 13 days to burn a kiln. The same thing is now done in six or seven, and what once required 60 cords of wood is now done with 30. The use of coal dust diminished the cost of bricks $2 per 1000, and more than 300,000,000 bricks are made here annually. Mr. Wood obtained a patent for his discovery, but he failed to realize wealth from the source that gave wealth to others, and he was robbed of his justly merited profits. In 1842 he removed to Tarrytown, where he died at the age of 80, on March 5, 1853. He was buried in Sleepy Hollow Cemetery, near the grave of Washington Irving.

In the Highlands.

The brick making business soon assumed vast proportions. The owners of real estate grew rich from the material furnished by their lands, and the manufacturers have gained wealth from the products of their industry. The proximity of the great city furnishes a ready market, and the Hudson River is a means of communication that makes transportation cheap and easy. All things combine to make Haverstraw one of the most available places for this business in the State. In 1852 a fresh impetus was added by the invention of the automatic brick machine by Richard Ver Valen, the present mayor of Haverstraw. He is accustomed to say that the great improvement flashed across his mind one Sunday morning when, during the sermon, his thoughts had wandered to the subject that had so long engrossed his attention, and he awoke from his revery just in time to hear the minister in his closing prayer invoke the Lord "to have mercy upon those whose thoughts had been in other places during the hours of divine service." At the present time 50 firms are engaged in the manufacture at Haverstraw, giving employment to nearly 3000 men, employing 170 machines and turning out in one year 302,647,000 brick, which would build a wall 10 feet high and 1 foot thick 220 miles long.

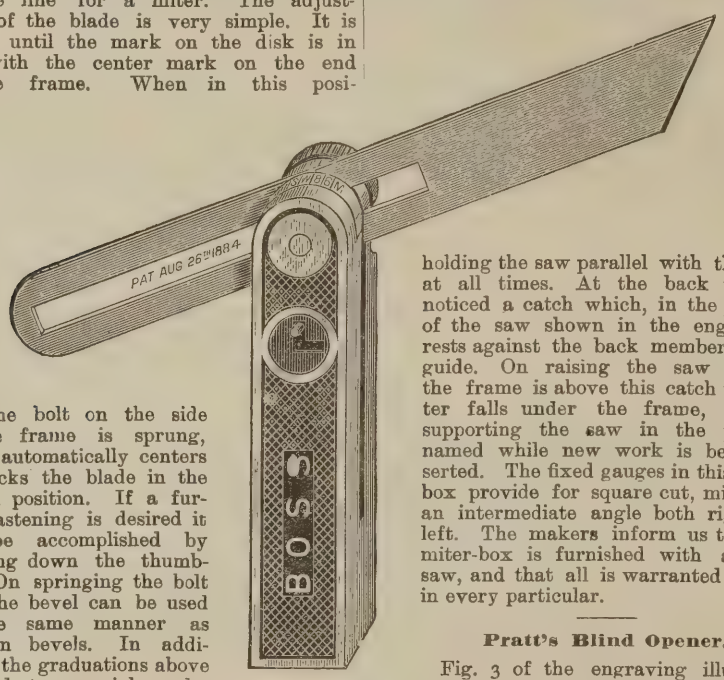
In Tremont Street.

A statement recently appeared in the Cologne *Gazette* of the cost of restoring and completing the great Cathedral from 1823, when the work was resumed after a neglect of nearly three-quarters of a century, down to the first of April of the present year. The amount, including a contribution of 250,000 marks from the Cathedral tax, was 21,000,000 marks, or $5,250,000.

NOVELTIES.

New Flush T-Bevel.

The Dirigo Tool Company, 245 Broadway, New York, have just ready for the market a new Flush T-Bevel, which they have named the "Boss," and which is illustrated in Fig. 1 of the engravings. The feature which distinguishes this bevel from others which have preceded it is the employment of a brass disk at the end of the frame, so connected with the blade as to enable the latter to be instantly and positively set to graduations on the edge of the former. This attachment is additional to the ordinary offices of the bevel, which are as well performed by this tool as the ordinary article. By inspection of the engraving the brass disk will be noticed near the top. On it occur the letters and figures "S W 8 6 M." Of these S indicates the position of the bevel for a square cut, or, in other words, 90°; W indicates window or sill pitch, and when the blade is set to this mark it is at an angle of 9°; 8 indicates octagon, or an angle of 22½°; 6 hexagon, at an angle of 30°, while M indicates 45°, or the line for a miter. The adjustment of the blade is very simple. It is moved until the mark on the disk is in line with the center mark on the end of the frame. When in this position the bolt on the side of the frame is sprung, which automatically centers and locks the blade in the desired position. If a further fastening is desired it may be accomplished by screwing down the thumb-nut. On springing the bolt back the bevel can be used in the same manner as common bevels. In addition to the graduations above referred to, special angles which a user has occasion to frequently employ can be marked on the disk and used in the same general manner as the angles described, thus adapting the tool to a wide range of special uses. The makers direct attention to the fact that the blade in this tool is of spring steel, of high temper, and that when it is bent by any accident it immediately springs back into its original shape. The bolt in the side and also the thumb-screw at the end are flush with the face of the tool, thus making it applicable under all circumstances.



Novelties.—Fig. 1.—New Flush T-Bevel.

The Hyde Miter-Box.

Fig. 2 represents a new Miter-Box that is being put upon the market by Nichols, Bellamy & Co. of 657 Washington street, Boston. This tool, the manufacturers state, has been designed to meet the demand for an accurate and at the same time low-priced miter-box. The construction is such that accuracy is assured in several important particulars. The adjustment of the saw with reference to different angles is made by a frame slipping over a central pin at the back, and one or the other of five pins of lesser hight arranged in the arc of a circle along the front. Long bearings are secured by this plan, and very nearly absolute accuracy. The saw is regulated with reference to the depth of the cut by means of the stop-gauge shown in the foreground and at the top of the saw. This gauge is set by a single thumb-screw, the saw-guide holding the saw parallel with the base at all times. At the back will be noticed a catch which, in the position of the saw shown in the engraving, rests against the back member of the guide. On raising the saw so that the frame is above this catch the latter falls under the frame, thereby supporting the saw in the position named while new work is being inserted. The fixed gauges in this miter-box provide for square cut, miter and an intermediate angle both right and left. The makers inform us that this miter-box is furnished with a back-saw, and that all is warranted perfect in every particular.

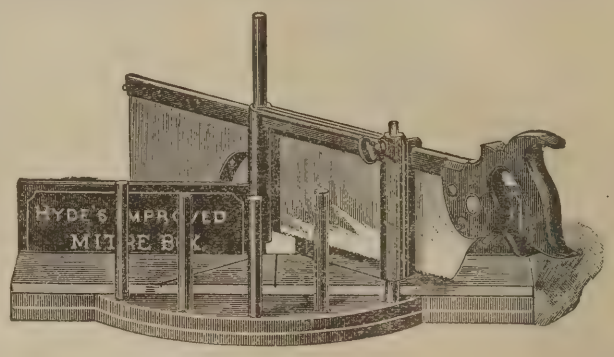


Fig. 2.—The Hyde Miter-Box.

Pratt's Blind Opener.

Fig. 3 of the engraving illustrates an article now being offered by the Millers Falls Company, of 74 Chambers street, New York. It is adapted to opening and shutting blinds without raising the window sash. The makers state that in its present form it is the result of long experiments with different kinds of Blind Openers. Its special advantage over others is that it is applicable to any blind without change of hinges. The plate to which the crank is shown attached is secured to the inside casing of the window, while the second and larger plate, upon which the ratchet-wheel is shown in place, is secured to the outside casing. The wire loop to which the thumb-screw is attached is inserted in the rail of the blind, and is fastened in place by the screw. The arm extending from the ratchet-wheel passes through the loop, as represented in the engraving, and moves the shutter as the wheel is turned. Whatever the hinges may be on the blinds, they are not disturbed. The loop shown in the engraving may be replaced by a screw-eye or wire staple placed in the rail of the blind, and the lever works in this as well as in the special fixture shown in the cut. The opener locks the blind fast at any point it may be when the crank is released. Another style of blind opener made by the same company is of such a form as to occupy the place of the lower hinge on the blind. In its general features it is the same as shown in the cut. A close examination of the engraving will show the great leverage which this form of construction possesses. The wheel or disk on the end of the shaft which goes through the casing or frame is so grooved as to mesh with the teeth of the disk that forms the end of the lever or arm. There is little or no lost motion, and the action is positive at every point.

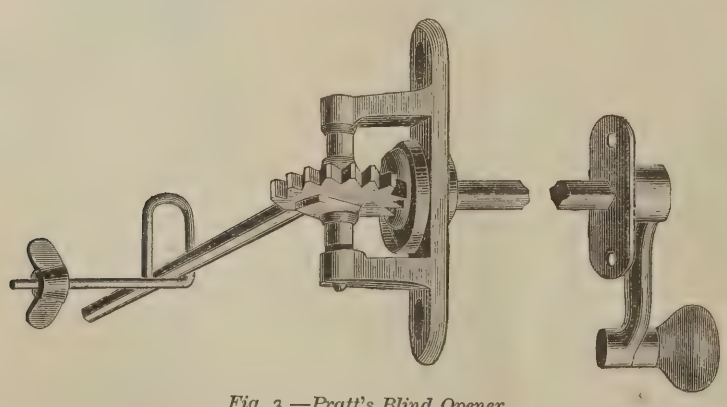


Fig. 3.—Pratt's Blind Opener.

The "Perfection" Weather Strip.

Fig. 4 of the engravings represents an automatic weather strip intended to prevent the entrance of currents of cold air under the outside doors of dwellings, and also to prevent the rain from driving up during the violent storms of summer. It is known as the "Perfection" Weather Strip, and is manufactured by the Richmond Weather Strip Company, Richmond, Ind. The device is arranged in two sections, so connected that as the door is opened the strip is released from its confined position against the sill and is raised high enough to pass freely over the sill or the carpet that may be inside the room. On shutting the door the strip is forced down into position by coming into contact with the knob or stud shown in the right of the frame, near the floor. The strip is made in different kinds of wood, thus adapting it for use with all kinds of finish. Among the special qualities to which the manufacturers direct attention may be mentioned that it is constructed without springs, triggers or circular irons, and has a positive action. It is counterbalanced in such a way as to produce the results above named. A modified form of this device is made, adapted to be used on double doors. Both styles are so constructed as to be readily fitted in place by carpenters and mechanics in general. The strip is adapted to the width of the door by cutting from the ends, for which purpose ample surplus wood is always allowed.

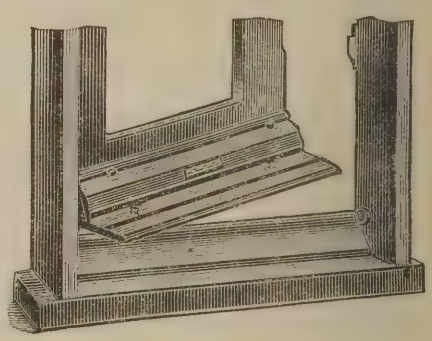
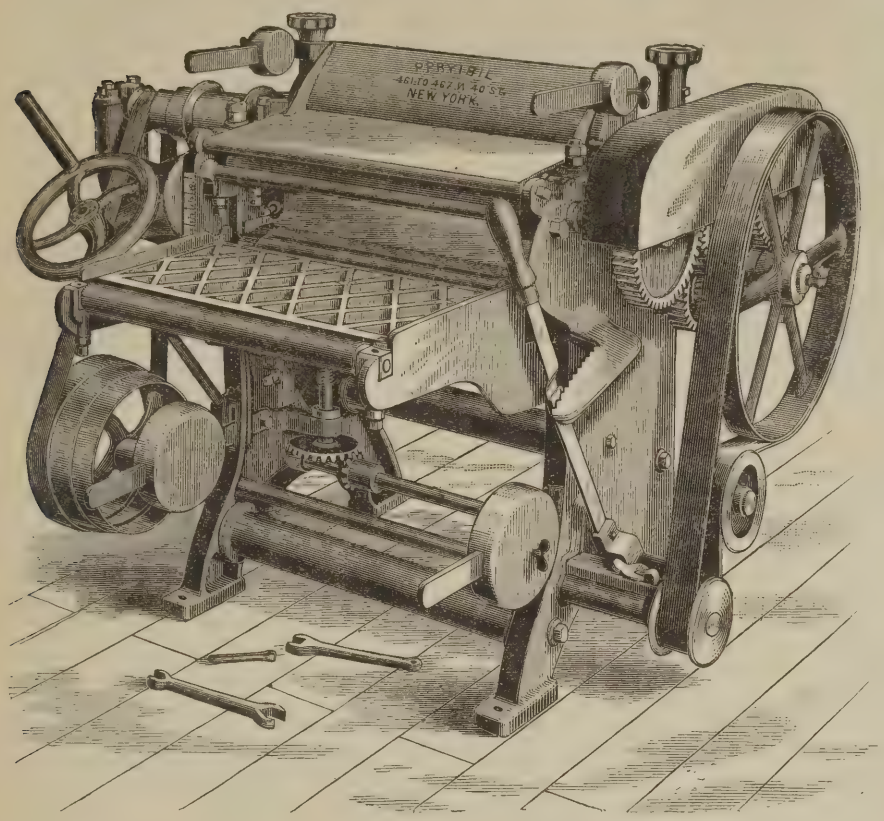


Fig. 4.—The "Perfection" Weather Strip.

New Narrow Planer.

P. Pryibil, corner of West Fortieth street and Tenth avenue, New York City, has recently perfected the 24-inch Planer illustrated in Fig. 5 of the engravings. This machine the maker recommends as a very strong and well-constructed device, capable of planing up to 24 inches wide and 3 inches thick. It is suitable for both heavy and light stuff, and also for material in short lengths. It is provided with a double-feed with four live rolls, two of which are in front and two behind the cutter-head. There are two presser-bars close to the knives, the front one of which is hinged and weighted. The back rolls are provided with self-adjusting scrapers, and are fitted with hinged covers which, together with the shaving-guard, can be sprung out of the way, permitting the knives to be whetted while in place. The table travels in adjustable jibbed slides, and is raised or lowered just $\frac{1}{16}$ inch by each turn of the hand-wheel shown at the left of the machine. By this means it is easy for the operator to know just how much the table is being lowered or raised when the adjustment is in progress. At the same time the scale just back of the hand-wheel shows at all times the thickness to which the machine is set.



Novelties.—Fig. 5.—Twenty-Four Inch Planer, Built by P. Pryibil, New York.

Self-Feeding Cross-Cut Saw.

The Egan Company, 221 West Front street, Cincinnati, Ohio, have recently issued their circulars describing the Self Feeding Railway Cut-Off Saw illustrated in Fig. 6 of the engravings. This tool may be regarded as a good illustration of the tendency among builders of all classes of machinery to apply automatic feed wherever it can be done. In no branch of business is this more important than in wood-working machinery. The manufacturers claim for this machine that it effects easily and quickly what has hitherto been one of the most laborious tasks in a wood-working shop, especially where heavy stuff is to be cut up. The general design of the machine and arrangement of parts is clearly shown in the engraving. The travel of the saw is easily adjustable, and the friction feed is self-releasing at each end of the stroke. The return motion of the saw is at a higher rate of speed than the forward motion, thus greatly facilitating the work. The stroke of travel of the saw may be regulated from a movement of 1 inch to 31 inches. The mandrel has an improved expansion device in it, enabling the operator to use saws of different-sized holes and yet have them run true. Saws of different diameters up to 20 inches may be used. In point of construction the machine is well made. The frame is cast whole, and is very broad and strong in all its parts. The slides on which the mandrel moves are cast on the frame, making a solid and durable bearing for the yoke which carries the saw. The manner of belting is new and is covered by a patent owned by the company. A tightener is placed in front, so that an endless belt can be used and any stretch taken up. With reference to the capacity of this machine the makers assert that with it one man will do the work of three, and do it more accurately than with the ordinary means in use. At the same time he will not expend more than one-quarter of the strength that was formerly required.

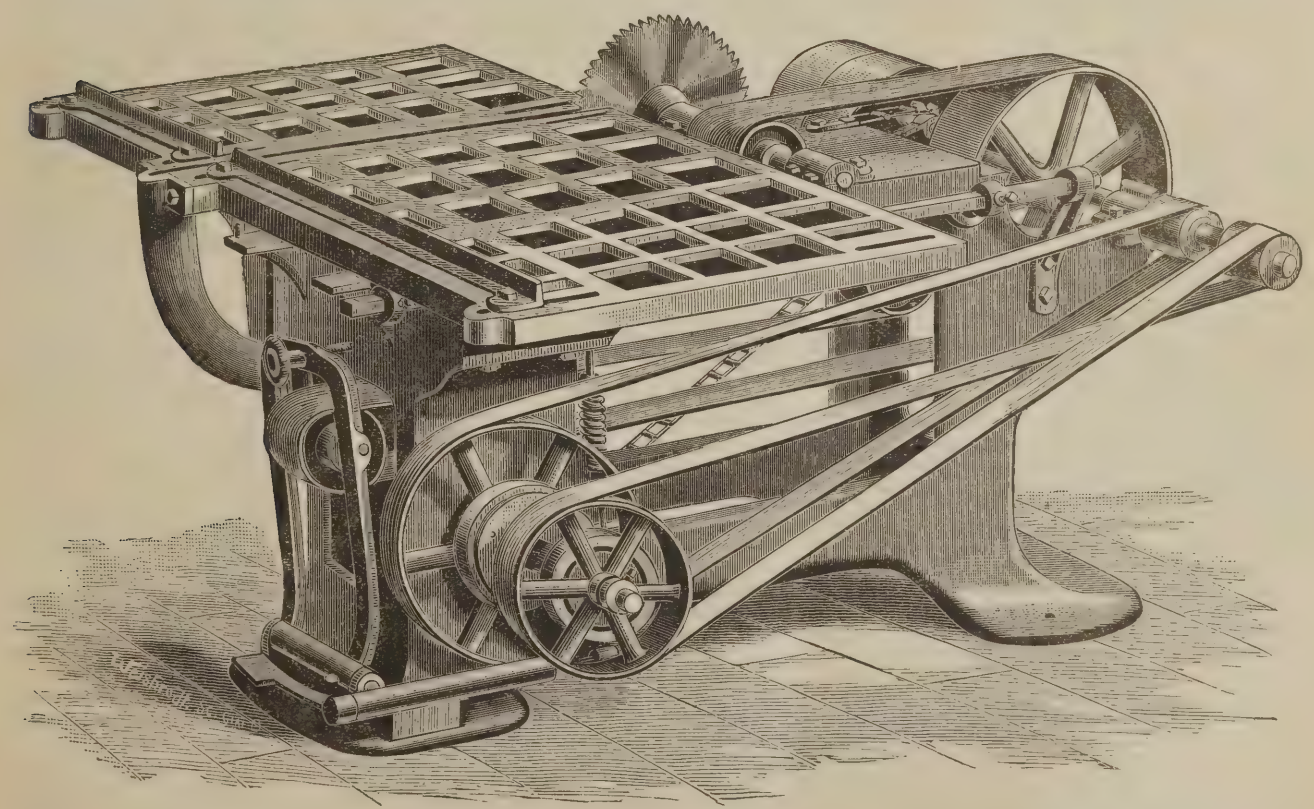


Fig. 6.—Self-Feeding Cross-Cut Saw, Built by the Egan Company, Cincinnati, Ohio.

Guaranteed Tin Plates.

We have at various times in the past directed attention to the efforts being made by certain houses in the tin-plate trade to reform many evil practices which exist in that line of business, and to secure to architects and builders a better quality of both terne and bright plates than have heretofore been available. Guaranteed plates have been upon the market for about a year past, and since their advent a great improvement has been made in the quality of roofing plates generally. While guaranteed plates the quality of which is fully assured and warranted by firms of undoubted responsibility would seem to afford architects and builders about all that could be asked in reason, certain houses who have introduced really good plates have found it necessary to take measures to make the fraudulent use of other plates in place of theirs impossible. Some means by which those who are not skilled in tin-plate work will be enabled to detect imitation plates has become necessary in order to render guarantees effective. A new method of branding plates, looking to the correction of abuses in this direction, is just announced by Merchant & Co., of Philadelphia. In a very handsome card which they are now sending out they state that hereafter their "Gilbertson's Old Method" and "Camaret" will have each sheet stamped with the brand, as well as be packed in boxes correctly branded, as heretofore. The advantage of this method to all who desire good tin roofs will be appreciated at a glance. There will no longer be any difficulty in determining whether a roofer is furnishing the exact plate specified, or is using something else of inferior quality. We regard this last piece of enterprise upon the part of the house named as one of the most important steps that has yet been taken in this trade. We have no doubt that in a very short time other houses will in the same manner arrange to protect first-class plates in whose reputation they are interested, so that at no very distant day competition among those who sell roofing plates, as well as among local roofing firms, will be upon plates of recognized quality about which there can be no dispute. The result of this cannot be other than an improvement in the general character of roofing work, wherever performed.

NOTES AND COMMENTS.

A correspondent in Lynchburg, Va., calls attention to a desirable opening that exists in that city for a first-class architect. The object of his letter is to obtain the name of some one with whom he may correspond We do not think that we can serve him or the architectural fraternity at large any better than by submitting the letter as it reaches us, with the suggestion that we shall be glad to forward all letters addressed to us to the writer: "Our city is very much in need of a first-class architect, one fully conversant with the business in all of its details, a live man with good practical ideas, with sufficient confidence in himself to take the lead in his line of business and to advance new ideas in keeping with the times. To such a man we believe there is no better opening in the country than our city affords. We have a population of about 30,000. We believe a competent man could get all the work he could do. We shall be glad to correspond with some good architect on this subject, and give him any information that he may ask in regard to the city or its people." Our correspondent is practically engaged in the building trade and knows whereof he speaks. We hope those who have the qualifications necessary, and who for any reason are seeking openings, will correspond with us.

The Nineteenth Annual Convention of the American Institute of Architects will convene at Nashville, Tenn., on Wednesday, October 21. The sessions of the convention, it is expected, will continue through two days. The complete programme of exercises, at this writing, has not been perfected in all its details. The outline sketch of the programme is as follows: 1. An exhibit of architectural drawings and building materials in the rooms of the Art Association of Nashville. To the exhibition of drawings it is hoped that contributions will be sent by many members of the Institute. The building materials exhibited will be such as are known to Tennessee. 2. First day, forenoon—Meeting of the A. I. A. Afternoon—Visit to some of the principal buildings in and around Nashville. Evening—Public reception and concert complimentary to the A. I. A. by the Art Association of Nashville. 3. Second day, forenoon—Meeting of the A. I. A. Afternoon—Visit to "Belle Meade," the famous stock farm of General Harding. Evening—Banquet complimentary to the A. I. A. by the Art Association of Nashville. It will also be the endeavor of the committee to present several papers upon technical and artistic topics, to be followed by short discussions. A circular to be issued about October 1 will give the whole programme for the convention in detail, with routes of travel, cost of transportation, and reduced rates for hotel accommodation at Nashville.

A correspondent of the *American Cabinet Maker* gives directions for getting out a new pattern of molding—for example, for inside finish, or decoration, or for a picture frame. His remarks will no doubt be interesting to our readers: "How do you get out a new pattern of molding? Do you prick around the sketch on the end of a pine stick and then work down to your prick-marks with hollows and rounds? Or do you work out the members separately and glue them together? Lots of work, isn't it? You are apt to get one end of the pattern too large or too small, and, when the molder man 'sets up' for it, he is almost sure to take off his size at just the spot where your pattern 'is a little out.' Perhaps you whittle a little section of your molding. You make it about ⅛ inch thick and send it down stairs with the instructions 'to make 48 like that 24 inches long, and 24 of the same 36 inches long.' The molder man can't do a decent job when he tries to 'set up' to your short sample. He is entitled to a pattern 6 inches long, and he should have it every time." With this introduction his directions, briefly stated, are as follows: Among the multitude of lines on the drawing of a new style of molding as it comes from the designer will be found a cross-section of the desired form. Prick it off on to another piece of paper. If you have a number of new moldings to make, get a section of each before you proceed further. Next select a piece of clean pine or white wood about 6 inches long. Square it off nicely and glue the paper you have pricked off on the end of the block. Be sure that the ends are cut square, otherwise there will be trouble from the fact that the piece will not stand true while the pattern is cut. When the glue is dry select the very best ⅛-inch band saw you have. Saw to the marks, and if you are competent to do a good job with a band-saw you will soon have a nice little pattern that you have sawed. As the saw must cut 6 inches of wood and cut it exactly with the grain, it must necessarily cut very slowly and very smoothly. The writer concludes that any one who tries this way will never again attempt to whittle out a new molding with hollows and rounds or tell the molder to set up by guess and then cut and try.

Inquiry is frequently made concerning building schools in this country. While several of our educational institutions have classes in architecture, and many of them give prominent attention to mechanical drawing, very little has yet been done on a basis adequately described by the term building school. The New York Trade Schools are perhaps the nearest approximation to anything of this kind, and classes conducted in it, notably that in bricklaying, have done themselves great credit. The following account of the Stuttgardt Building School, from the pen of J. Scott Russel, is of interest in this connection: "Some of the most distinguished directors of the technical university represented to the Government the expediency of forming a new school, intended for building crafts and tradesmen of the rank immediately under the professional men and skilled masters of the technical university. That was accordingly established, and succeeded so quickly and so completely that it became necessary to erect quite as large and as handsome a building, and to devote quite as large a staff to that purpose, as to the original polytechnic university. It is now one of the most remarkable and meritorious schools on the Continent. The men whom it was especially designed to help in their trades were stonemasons, bricklayers and carpenters, to be trained for future master builders; lower-class builders to be trained for master builders, constructors of public works, subterranean works, and constructors of reservoirs; constructors of water works, river works and mill works, and land surveyors of the first and second class. The general workmen whose education it undertakes are plasterers, tilers, roofers, joiners and carpenters, glaziers, turners, decorators, ornament sculptors, modelers, engravers, smiths, gold and silver workers, gardeners and husbandmen. Its great merit is its perfect adaptation to the wants of each separate class of persons. For young men who are much employed in winter and less in summer it provides summer courses of study, and gives them vacation in winter, and *vice versa*. In has classes in the early morning, the same at mid-day, and the same over again in the evening, and the hours of the different classes are so timed that the pupil may attend many or few hours of the day and still obtain the studies he requires. This school is presided over by the most distinguished architect of Würtemberg, with no fewer than 28 professors and masters under him. Systematic courses are provided for those who can go through the education required to obtain certificates of competence, and their estimation of its value is proved by the fact that the school is crowded by exactly that class of men whom it was intended to benefit."

Although the Cotton Centennial Exposition at New Orleans last year proved far less successful than was anticipated, the projectors of a new exposition to be held in the same city the coming winter have not been the least deterred in their enterprise. The new organization in a certain sense has been founded on the ruins of the old one. It has become possessor of the buildings and other property belonging to the old exhibition at a very small cost, comparatively speaking. The new enterprise is known as the North, Central and South American Exhibition, and is to open in November next, and to continue until the last of March. The leading object of this exposition is to develope more intimate trade relations between the producers and consumers of Mexico, Central America, the West India Islands and South America, and the producers and consumers in our own country. Some very interesting and instructive printed matter has been prepared for the new corporation for general distribution, including a map which shows the relationship of the United States to the other countries and Governments of the Western Hemisphere.

NEW PUBLICATIONS.

MANUAL OF INDUSTRIAL DRAWING FOR CARPENTERS AND OTHER WOOD-WORKERS. By W. F. Decker, Instructor in Drawing in the University of Minnesota. Size 6 x 9 inches, 176 pages, bound in cloth, illustrated. Published by Wm. T. Comstock. Price, $2.

After very careful examination of this work we are disposed to regard it as one of the most practical, and therefore the most valuable, books on mechanical drawing for the use of apprentices and workmen that has yet appeared. The great majority of books relating to drawing and draftsmenship have left a wide gulf between the theoretical presentation of the subject and what is required in practical every-day work. The present volume is characterized by a directness of method that we have seldom seen equaled The object of the work, as we gain from the preface, is twofold. It is intended to furnish instruction in the art of making working drawings, and to explain the advantages of such drawings to

any who may have occasion to use them. Under the first head everything is supplied from instruction in making rough sketches, such as a foreman would dash off for the guidance of a workman, to the lettering and titles of the best finished drawings prepared by architects. "Drawing Instruments and Materials" are considered, with many practical hints which other authors have neglected; "Definitions and Geometrical Problems" are also discussed, and then follow chapters on "Elementary Projections," "Applications of Projections," "Isometrical and Cabinet Projections," "House Plans" and "Methods of Laying Out Rafters." The author is evidently well informed in the ordinary work of carpenters and builders, as well as in practical draftsmanship. The appendix contains the specification for a frame building.

SANITARY HOUSE INSPECTION; OR, HINTS AND HELPS REGARDING THE CHOICE OF A HEALTHFUL HOME IN CITY OR COUNTRY. By Wm. Paul Gerhard. Size 5½ x 7 inches, bound in cloth, 145 pages. Published by John Wiley & Sons. Price, $1.25.

In this little volume there are outlined the main features of a sanitary house inspection. While its principal aim is to instruct the householder, it also is of a character to prove useful to architects, builders, health officers, family physicians and others. The principal scope of the book is a guide in the search of defects, and in a certain sense it is introductory to other books by the same author, such as "House Drainage and Sanitary Plumbing," and "Hints on the Drainage and Sewerage of Dwellings." It is likewise introductory to new works which the author announces are soon to appear, one on "Sanitary Architecture" and another on "Domestic Sanitary Appliances." These, we are informed, will discuss more in detail matters merely mentioned or hinted at in the present volume. Some of the principal chapters in this work are "Essentials of a Healthful Home," "Inspection of City Houses," Inspection of Tenement Houses," "Inspection of Country Houses," "Summer Boarding Houses and Summer Resorts" and "Necessity of Periodical Inspection."

PLUMBING AND HOUSE-DRAINAGE PROBLEMS. From the *Sanitary Engineer*. Size 9 x 6 inches, bound in cloth, 244 pages, with 146 illustrations. Published by the *Sanitary Engineer*. Price, $2.

This work is a collection of plumbing problems or questions, answers and descriptions relating to house drainage and plumbing, which has been compiled from the files of the *Sanitary Engineer*. The problems are arranged under several general heads, among which may be mentioned "Dangerous Blunders in Plumbing," "House Drainage," "Hot-Water Circulation" and "Miscellaneous." A chapter entitled "Hot-Water Supply in Various Buildings" describes features of the plumbing in a number of very prominent houses in New York City and vicinity. A form of plumbing specification for an isolated country house is appended, and there is also given the text of plumbing laws and regulations in force in New York, Brooklyn and Boston. The whole is supplemental by an alphabetical index.

HEALTHY FOUNDATIONS FOR HOUSES. By Glen Brown. Van Nostrand's Science Series. 51 illustrations. Price, 50 cents.

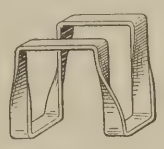
This is a reprint from the *Sanitary Engineer* of a series of papers published in that journal during the year 1884. The illustrations have been made from drawings prepared by the author. New matter and some new illustrations have been added where it was thought the value of the book would be increased thereby. The subject is very thoroughly discussed in four general chapters bearing the following titles: "Natural Foundations," "Drainage," "Foundation Walls" and "Miscellaneous."

POCKET-BOOK OF MECHANICS AND ENGINEERING. By John W. Nystrom. Size 6⅜ x 4 inches, 672 pages. Published by the J. B. Lippincott Company. Price, $3.50.

The late Mr. Nystrom's pocket-book is so well known that it is unnecessary for us to go into details as to its arrangement and the ground covered by it. The matter accumulated since the last revision and incorporated in the eighteenth edition, before us, amounts to about 200 new pages, 159 tables and 251 illustrations. The whole number of illustrations in the book is now 660. The new subject matter is principally elements of mechanics, static and dynamic tables, steam engineering, belting, gearing, wire ropes of iron, steel and copper, electro-dynamics and physical sciences in general. The conversion of English and French weights and measures extends to 50 pages. The elements of mechanics are brought down to a simple form, with strict precision in the meaning of mechanical terms as used in the shop. The formulæ and tables for belting are probably the most complete yet published on that subject. The subject of electro-dynamics is reduced to its simplest form.

Stirrup Joint.

It is one of the requirements of the building laws of New York and some of the other Eastern cities that every cross-beam



Stirrup Joints.—Fig. 1.—Stirrup of Bar Iron.

that has a number of tail-beams to support, as in making an opening for a flight of stairs or for other similar purposes, shall be hung up in iron stirrups of a width and thickness to conform with the size of the framework. In Fig. 1 of the accompanying illustrations we show such a stirrup. Fig. 2 shows the application, or the stirrup in place, with timbers intersecting at right

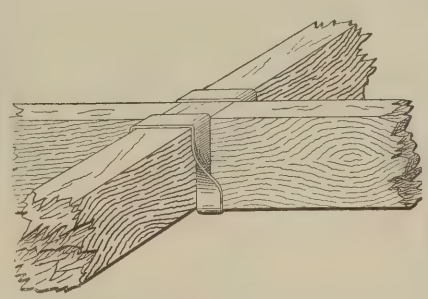


Fig. 2.—Floor Beams United by a Stirrup.

angles. A stirrup of this kind, where there is only one end of a cross-beam to support, can be made without a welded joint and can be left as shown in Fig. 3. When in this position there is a good chance for the joint bolt to head the beam firmly in its seat while it is resting in the stirrup. As long as floor joists must be divided to make room for cross-beams that cannot be dis-

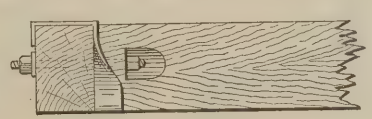


Fig. 3.—Stirrup Supporting the End of a Cross-Beam.

turbed without introducing a source of weakness, a tenacious element like that of wrought iron, and one that can offer as much strength as the woodwork without any special demand for room, is an important factor both in the remodeling of structures and in the construction of new work. Stirrups of the kind shown in Fig. 1 may be made of flat bar iron of 2 inches in width and from ⅜ to ½ inch in thickness, according to the size of beam to be supported. The shape is one which any blacksmith should be able to produce to order, being formed out of a single piece of iron with one weld.

Imitation marble is occasionally demanded in building construction, although the canons of true art are opposed to imitations of any kind. A recipe given by a prominent decorator of Vienna for preparing imitation marble for all kinds of decorative purposes is as follows: Mix 1 pound finely-powdered lime into a thick paste with water, and add ½ pound of colaphane, or, what is better, Venice turpentine. Allow the mixture to stand for some time, and then work up with it suitable quantities of fine white chalk and various-colored earths, adding a few drops of olive oil if necessary. A soft mass is thus obtained which can be molded, like plaster-of-paris, to any desired form; it can be rolled out on a warm metal plate, or pressed under wooden rollers into thin sheets which can be glued to the surface to be decorated, like ordinary veneers, and left to harden. It hardens and takes a good surface. Any cavities that appear must be filled up with some of the composition mixed with oil of turpentine. The composition will keep fit for use for some time if covered with a damp cloth while moist.

Modern House Painting.

A recent issue of the *Painter's Magazine* contained some remarks on house painting, both with reference to inside decorations and exterior painting, that will be of interest to our readers:

With the improvement in the style and structural arrangements of interiors of houses there has come in a demand for higher art in color decoration. We allude particularly to the frescoing and tinting of walls and ceilings. In fresco work choice effects are gained by carrying up geometric or arabesque designs one-half or two-thirds the hight of the wall, giving to the rest of the surface up to the frieze a monochrome tint. A handsome dado design for halls consists of a series of tall, flowering plants not too naturalistic; those of a wild species are preferable. In such cases a few light, meandering dashes of green here and there will suffice to suggest a green sward. As a ground for hall walls, plain or to be figured, a grayish olive is excellent; a warm, light gray has a rich, quiet effect, and a golden brown is to be admired. Stenciling, which offers great resources, is best displayed in a few colors. Strong yellows are objectionable as a ground, looking crude in artificial light. The pure or positive colors may be freely admitted to cornice or frieze. The frieze permits of bold, and even of somewhat florid, decoration. It should, at all events as to color, be bright and cheerful. Both for halls and bedrooms a comparatively new process of mural decoration may be tried with advantage. It consists in painting patterns on the plaster or mortar, with powdered colors mixed with distilled water, without either lime, size or gum. After applying the powder the colors are fixed by sprinkling the surface with a fine shower of water glass, or soluble alkaline silicate diluted with water, the colors thus becoming incorporated with the plaster. The fixity of color that ensues is due to the natural affinity of silica, sand and lime. The colors are without gloss, but present a certain pleasing depth.

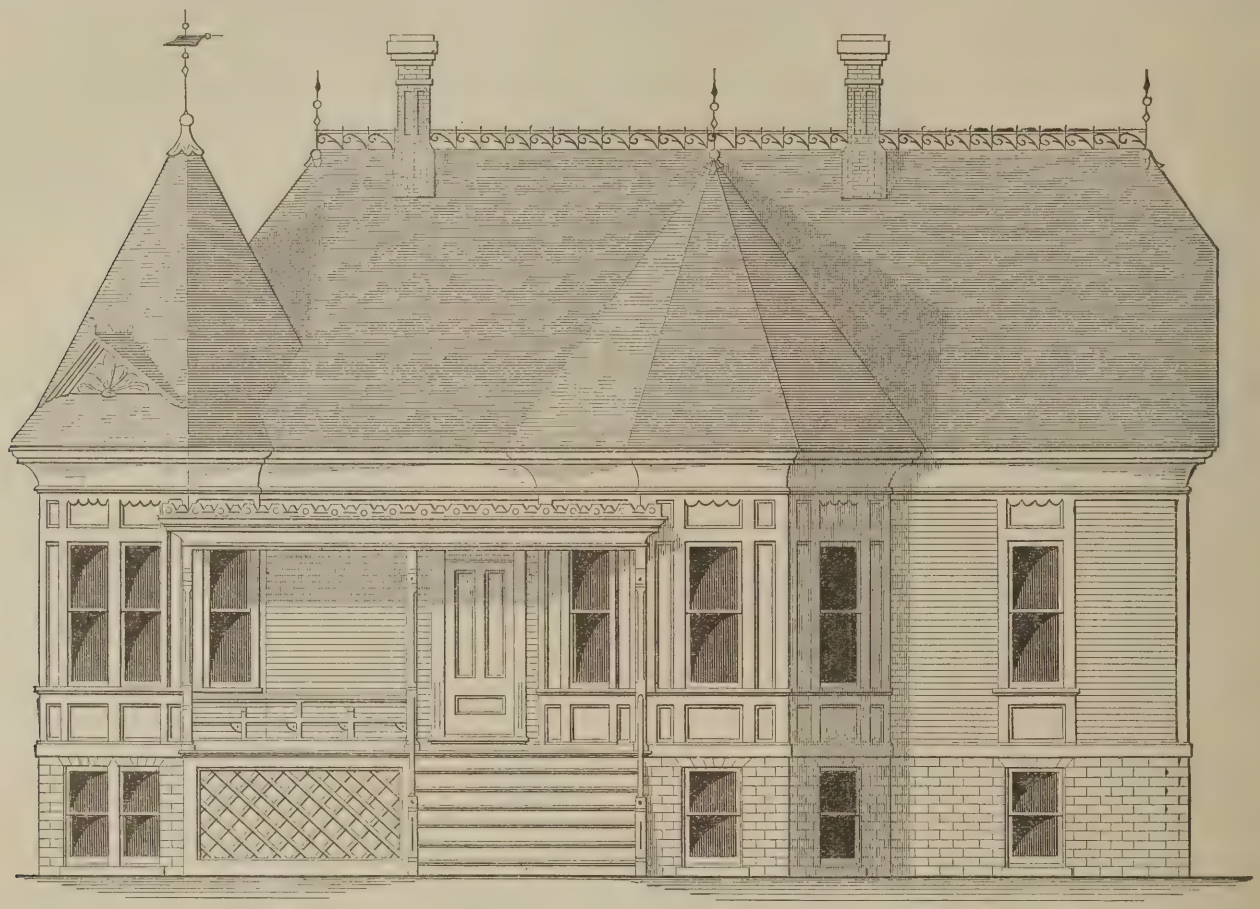
The color decoration of ceiling confessedly demands considerable skill and judgment, not merely as to design and selection of colors, but the proportions of the latter. Ornament upon it, though not in such abundance as on the wall, is necessarily more prominent. The space being unobstructed, there is fine scope for unique effect in design. Among pleasing artistic designs for center of ceiling, free from molded work, which we have lately seen, is a honeysuckle inclosed in Etruscan band of red and blue, the position of the flowers of the plant alternating, now at the edge and partially overlapping circle, and next thrown out toward the center.

Although the composite style of seaside and summer country residences has received severe criticism from a number of self-constituted critics, it must be admitted that they have, especially of late, afforded the opportunity for practice in a comparatively new line of painting in this country, namely, artistic exterior coloring. It is easy to find fault with the efforts of the painter or decorator in this line; to quibble at any com-

bination of colors instead of pointing out how such combinations can be improved. For ourselves, we confess we admire the setting off of fronts, verandas, gables, roofs, pinnacles, and even chimneys, with appropriate hues, and have no patience with a leading architect, who, having probably read something about leaving everything to nature, or imagining that the much bepraised neutral hues are drabs, or fearful that close inspection. A city set upon a hill must be seen to advantage in the right focus. So with a painted house. We do not go near it to scrutinize surface and to examine details, as in a canvas painting. The combination of hues, whether on sides or roofs of different elevation and pitch, or columns, capitals, window borders, towers and fretted eaves, is best seen at a distance. In painting a house the spectator's eye at such a distance would seem to contradict aerial influence. The phenomenon of the strength of bright colors in the distance is extremely curious.

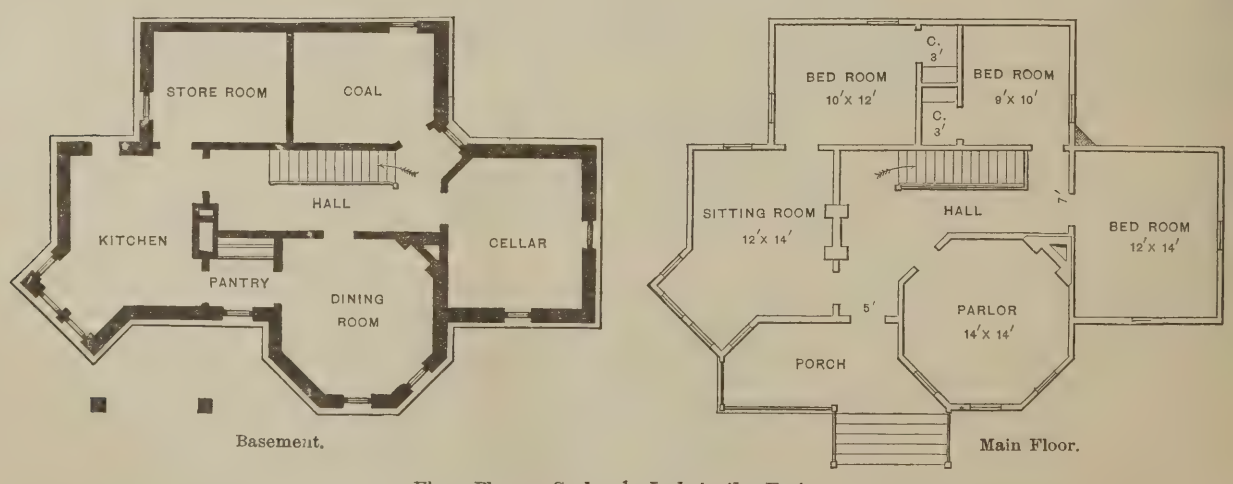
One-Story House with Basement.

The accompanying elevations and plans of a one-story dwelling with basement are furnished us by Mr. S. A. Bishop, architect,



Study in Design for One-Story House with Basement.—Front Elevation.—Scale, ⅛ Inch to the Foot.—S. A. Bishop, Architect, Smethport, Pa.

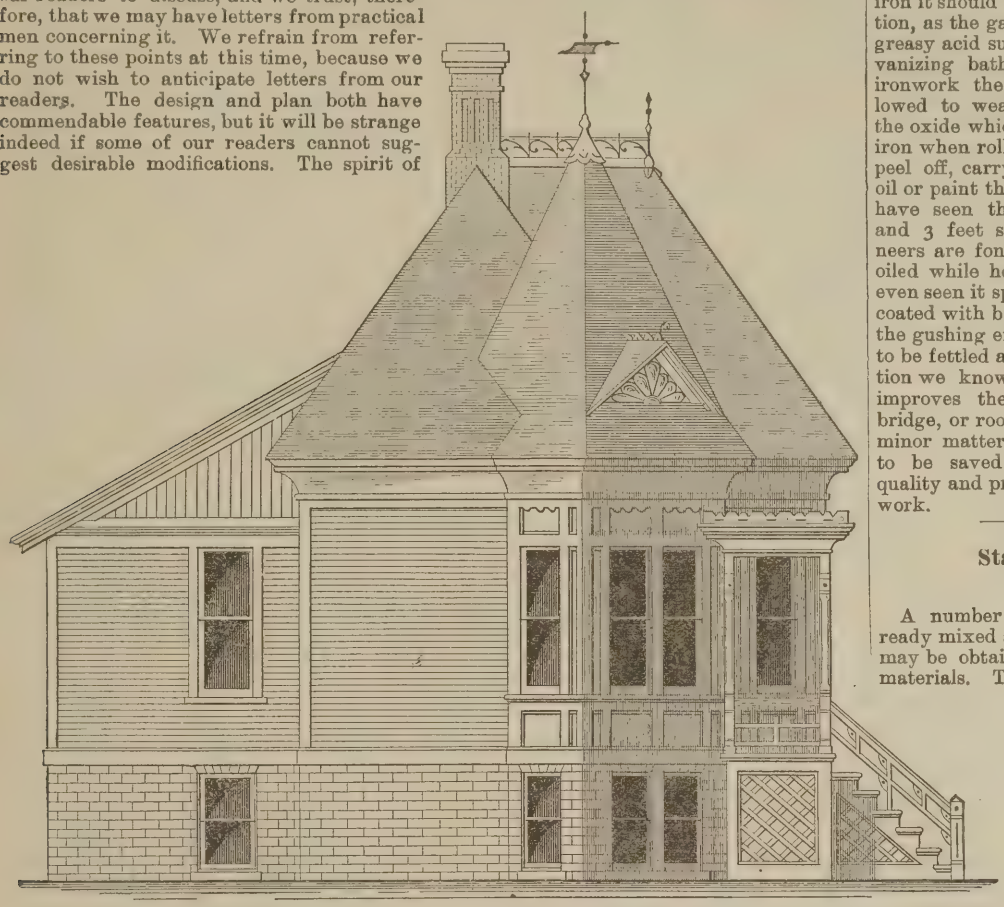
positive colors will injure his precious "lines," urges, in his professional journal, that a "shingle" seaside or country dwelling had best be left to time and weather, as nothing would improve the picturesque aspect it would then assume. This is simplicity with a vengeance. Architects all along have stood too much in the way of decorative color art. We live in a world of color, and the should be consulted, which only seeks for minutiæ of form and color as the object is brought nearer. It becomes necessary, then, that masses be strongly preserved, and the larger the house the lighter should be the tone of its main surface or sides. Let this, if you will, have the strongest contrasts in the coloring of accessories, and the whole will look the better at a far remove from it, of Smethport, Pa., designs by whom have already appeared in our columns. In his letter accompanying this study Mr. Bishop says he has had numerous inquiries from various sections of the country with regard to one-story houses with basements. He has endeavored in the design submitted to meet the requirements expressed by some of his correspondents. The outside basement



Floor Plans.—Scale, $\frac{1}{16}$ Inch to the Foot.

mere tyro in chromatics recognizes the power of color, not only charmingly to vary surface, but to emphasize relief. And here let us point out that the judiciousness of colors given to a "cottage by the sea," or a mansion set in a wide landscape or a forest lodge, are not to be solely judged by the chromatic appearance of the structure on a the principle being that, if we reduce any scene of nature by a diminishing glass to very small dimensions, the quantity of color, which is never lost, becomes concentrated and therefore more intense. Color in this view contrasts powerfully with perspective itself, and is often in the distance, by being to the eye reduced, of an intensity that walls are intended to be carried up with stone to the grade line. From the grade line the walls are to be of brick, built flush with the stone on the inside, and having a 2-inch air space, to start at the footing course of the foundation. With regard to inside arrangement and the general exterior finish, the author refers us to the plans and

elevations. We understand Mr. Bishop's object in sending these plans for publication to be twofold—first, that of contributing to our columns such a design as will prove valuable to our readers, and, second, that of obtaining criticisms and suggestions of improvments. We have scanned the study submitted herewith very carefully, and note several points which it seems to us would be profitable for our readers to discuss, and we trust, therefore, that we may have letters from practical men concerning it. We refrain from referring to these points at this time, because we do not wish to anticipate letters from our readers. The design and plan both have commendable features, but it will be strange indeed if some of our readers cannot suggest desirable modifications. The spirit of



One-Story House with Basement.—Side Elevation.—Scale, ⅛ Inch to the Foot.

friendly criticism manifested in the past by readers of this journal has been of great advantage to all, and we trust it may be continued indefinitely for the future.

Painting Ironwork.

A writer in the *Mechanical World*, in considering the general question of painting ironwork, presents some interesting facts, and also alludes to a treatment for the surface of galvanized iron previous to painting it. The article is written from an English standpoint, but contains many features that will be valuable to our readers:

The painting of ironwork is one of the most neglected, yet important, factors in its preservation, and one to which the mechanical engineer rarely devotes much time or thought. The majority of specifications merely state that the ironwork is to receive one, two or three coats, as the case may be, ignoring entirely the quality of the paint. Perhaps the engineer is not wholly to blame for this, as the manufacturers of paint, like other venders of special articles, puff their rival wares until every one except the expert is quite at a loss what special paint to choose. As a general rule, price is the first thing which influences the choice of paint, after which comes color, and finally coloring power. The preservative action is seldom considered, whereas if this were kept prominently forward we should have had exhaustive experiments on the subject and some concensus of opinion as to the proper paint to use for ironwork, one which would thoroughly preserve it under the most adverse circumstances, thereby saving the loss due to oxidation.

A paint to preserve ironwork should possess great firmness, good hardening properties, it should be elastic, and expand and contract readily with the iron at varying temperatures. Of the best paints those most used are the oxide of iron and red and other colors of lead paints. Oxide of iron paints possess greater covering power than lead paints in the proportion of three to two. From some experiments which have been made with some of Wolston's Torbay oxide of iron paint, it was found that on a surface of 10 superficial yards it took, for the first coat of oxide, 1 pound; for the second coat, 1½ pounds, and for the third coat, 2 pounds; while with the lead paint 1½ pounds were used for the first coat, 2½ pounds for the second coat, 3½ pounds for the third coat. The manufacture of what is known as the Torbay oxide paints is principally in the hands of two firms, the Torbay & Dart Paint Company and the Torbay Paint Company. These firms make it from the natural oxide found in abundance at Brixham, South Devon. Oxide of iron paint is also made from the natural oxide at Via Gellia, near Matlock, Derbyshire, and at many other places in the Kingdom. The oxide is thoroughly pulverized, levigated and washed through a woven mesh, finally passing through a brass-woven mesh of over 4000 holes to the square inch. The pigment combines thoroughly with iron, entering minutely into its pores by reason of its extreme fineness.

It is claimed by the makers of paint from natural oxides that these oxides possess some mysterious advantages over artificial oxides which have been obtained as by-products from chemicals, that the paints from artificial oxides do not possess good covering powers, that they have not the power of amalgamating with oil, and that they have an acid reaction which necessarily corrodes the iron. This may be the fact in some cases, but we have seen artificial oxide paints which have none of these disadvantages, and which have a decided alkaline reaction, thus equaling, if not rivaling, the natural oxide paint, and, being made from waste products, they are necessarily cheaper. A good paint for ironwork should be free from grit, uniform in quality, unchangeable under atmospheric influences, possess great covering powers, and be of an alkaline nature. The whole of these qualities can be tested by the ordinary painter under proper supervision, except the last, which requires chemical knowledge, and we should strongly recommend the users of paint for ironwork to test their paints in conjunction with a qualified analytical chemist who has made the subject his study.

Before painting the surface of galvanized iron it should be washed by an alkaline solution, as the galvanized iron frequently has a greasy acid surface when it leaves the galvanizing bath. In painting constructional ironwork the wrought iron should be allowed to weather first before painting, as the oxide which forms on the surface of the iron when rolled will always sooner or later peel off, carrying whatever coats of boiled oil or paint there may be put upon it. We have seen this oxide peeled off in flakes 2 and 3 feet square; we know that engineers are fond of specifying the iron to be oiled while hot from the rolls, and we have even seen it specified that castings should be coated with boiled oil while red hot. How the gushing engineer expected the castings to be fettled and cleaned before this operation we know not. A good coat of paint improves the appearance of a machine, bridge, or roof, and, although it may seem a minor matter, we believe there is money to be saved by careful attention to the quality and price of the paint used on ironwork.

Staining Floors.

A number of different kinds of stains ready mixed and in shape to apply to floors may be obtained from dealers in painters' materials. These are not always satisfactory, however, and accordingly recipes for other mixtures are occasionally acceptable. Old oak, very dry, is imitated by a mixture very generally sold, and which is supplied in several different grades. For a pale shade of oak raw sienna powder, mixed with water and well rubbed into the boards, may be used. Pour the liquid into a saucer, dip the brush and saturate thoroughly and then rub evenly over the wood, and dry instantly with a soft cloth. To insure success this must be done quickly and evenly. For mahogany staining use a mixture containing ½ pound of madder and 2 ounces of logwood chips boiled in a gallon of water. Brush this over the wood while hot. When dry go over this with a solution of potash, 2 drams to 1 quart of water; afterward polish. A redder shade may be produced by smearing the surface with a strong solution of permanganate of potash. This is to be left on for a longer or shorter time, according to the shade required. In most cases five minutes is long enough. The wood is then carefully washed, dried and polished in the ordinary way. A cheap oak stain is made of equal parts of potash and pearlash, using 2 ounces of each to a quart of water. As potash is a solvent, care must be taken to keep it from the hands, as otherwise it would make them sore. An old brush should be used, since the lye will spoil whatever is used in it.

Mr. J. Mason Kirby, of Atlantic City, N. J, is reported to have printed upon his business card the term "Elephant Architect," as indicating the special department of architecture to which he is devoting his talents. This gentleman designed the elephant that has decorated a plot of ground near Atlantic City, N. J., for some time past, and is also the author of the design and superintendent of construction of the elephant at Coney Island. One of our exchanges hailing from a city in the western part, of the State bears the significant title of "Buffalo *Builder*." With "elephant architect" and "Buffalo builder" already secured, it would seem as though the balance of the menagerie might easily be found.

CORRESPONDENCE.

Time Slips.

From G. E. C., *Menomonie.*—I have never seen anything in *Carpentry and Building* with regard to systems of keeping time applicable in cases where a number of workmen are employed upon small jobs. I have thought it might prove of benefit to my fellow-contractors to lay before them the results of my experience. Every one who has had occasion to work hands on small jobs knows how difficult it is to keep the time for each job correctly. If the workman does not make a record of his time at once he can scarcely ever tell, even the next day, where or how his time was spent. I have experimented with a number of different blanks and finally have adopted one, a sample of which I inclose. I send it filled out as the workman would hand it in. I have them put up in small books, one of which each man carries with him. Each day he detaches his ticket and leaves it in the office, retaining on the stub a record for his own use. I also use the same form on my contracts, as I often find it convenient to know just what each part of a given job costs me. Careful scrutiny of tickets of this kind shows what kind of work each man can do to the best advantage.

Date.....*July 6, 1885*...
Workman..*H. E. B*.....
For whom..*Jones & McNally*
Kind work....*Rep. Floor and Hanging Screen Doors*...
Hours.....*10*.....

WORKMAN'S DAILY REPORT.

Monday, July 6, 1885.

I have worked this day as follows:

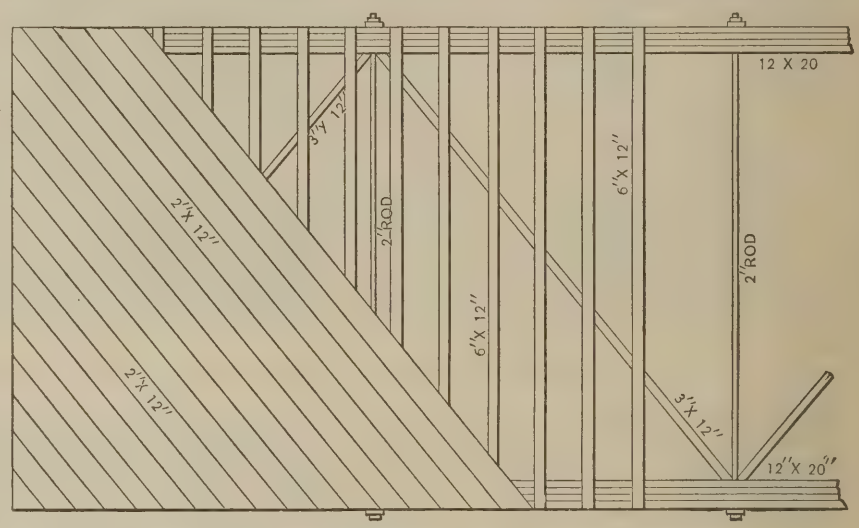
For Whom.	Kind of Work.	Hrs.
Chas. Jones....	*Repairing Floor*.....	*4*
C. K. McNally	*Hanging Scr'n Doors*..	*6*
		10

Henry E. Boynton.

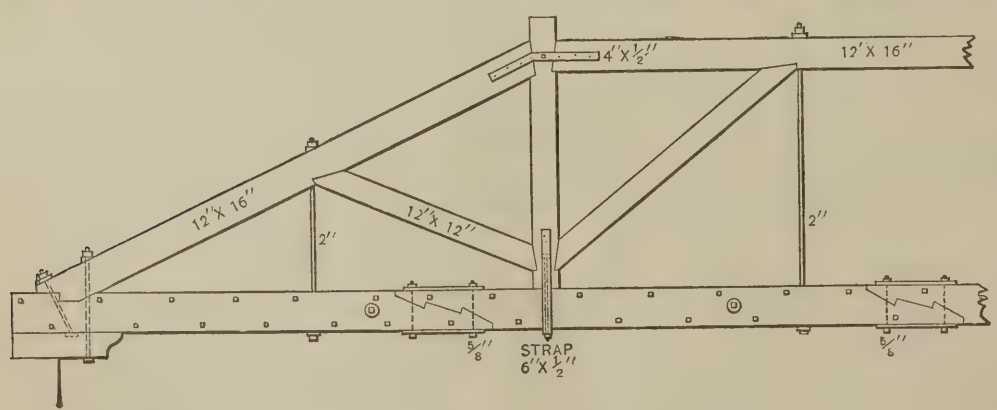
Form of Time Slip Used by G. E. C.

Bridge Designs.

From T. W. M., *Peoria, Ill.*—I inclose a design for a wagon or railway bridge, in which the construction is clearly shown as well as the sizes of the different parts. Where strength and stability are desired I would not recommend that the parts be made lighter than indicated. In addition to the elevation of the truss I show a plan of the roadway, including the cross-braces, floor beams and planking. The cross-braces are 3 x 12, the floor beams 6 x 12, and the planking 2 x 12, laid diagonally. Other necessary particulars are furnished by the drawings.



Timbers and Floors of Roadway in T. W. M's. Bridge.



Design For Wagon Bridge, Contributed by T. W. M.—Scale, ⅛ Inch to the Foot.

From T. S., *Coal Valley, W. Va.*—In the June issue there is presented a plan of a highway bridge, and a very good bridge it is. Credit for it rightfully belongs to the engineers of the Erie Canal. Thinning of the needle beams at the ends is not necessary, nor is it desirable except in the case of a canal where a certain specified head-room must be maintained. The old records of the State engineers of New York will give full details for this bridge and for others similar to it, with different lengths of span.

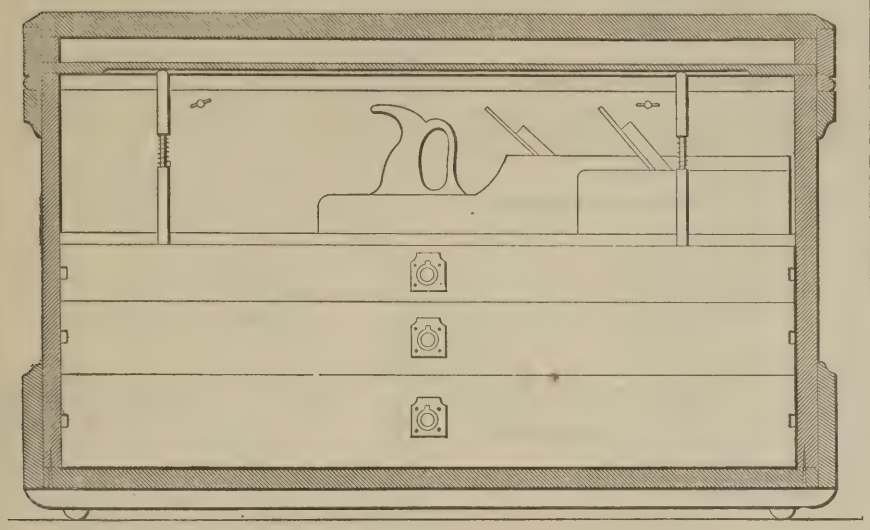
Substitute for Lath and Plaster.

From C. J. B., *Minneapolis, Minn.*—I think "G. S.," of North Solon, Ohio, will find Fay's manila paper the best substitute for lath and plaster that is available. He can obtain particulars by addressing J. D. Cleghorn, Minneapolis, Minn. The paper is very strong and probably keeps out cold as well as lath and plaster. Unless it be impossible to wait for mortar to be put on I would recommend plaster instead of paper. The expense of putting on paper is about 15 cents per square yard, including everything. In this neighborhood we get a good quality of plastering done for 18 cents to 20 cents per square yard. Accordingly, I prefer plastering, as already mentioned. Last spring it was necessary for me to build a house in a month. I put up a building 20 x 26 feet inside, and finished the interior with Fay's manila paper. We have no trouble in keeping the house from freezing with a single wood stove, although on New Year's night the mercury went down to 40° below zero. It is my opinion that after eight months' usage the paper will crack. It is very difficult to put paper on so that it will not wrinkle from the heat of stoves. This general statement, I think, will give your correspondent an idea of the relative advantages of paper and plaster for finishing the inside of houses.

Design for Tool-Chest.

From S. H. W., *Bridgeport, Conn.*—I was much interested in the description of a tool-chest published in a recent number of *Carpentry and Building.* It has reminded me that I have one which is generally conceded to be about the handiest of the dozen and a half chests that adorn our shop. The chest described by "J. W. J., while very nice to look at, strikes me as not being exactly what the correspondent wants who originally proposed the question. "J. W. J.'s" chest reminds me of an incident that occurred several years ago. Several of us were looking at a nicely-finished hardwood chest that one of the men had just brought in. A veteran pattern-maker, after examining it in silence, remarked reflectively, as he ejected a stream of tobacco juice in close proximity to it: "Well, I was just such a fool myself once upon a time." After such a piece of property has traveled one or two thousand miles, by railroad or otherwise, the hard finish begins to look hard indeed. All joking aside, what we wood butchers want is, not a chest fine enough to adorn the best room in our house, but one that can stand out in the weather, take all the hard knocks it is likely to receive, and these are not a few, and at the same time be both portable and convenient. I think mine possesses these qualities. It was originally of the orthodox pattern. There were three drawers at the back side, half the width of the chest, saw till in the front and storage for molding tools, &c., at the bottom. Three years ago I lost most of my tools by a fire, and then thought that less room would do, so I cut the chest down about 6 inches all around, leaving it 16 inches wide by 2 feet 7 inches long inside and 16 inches deep, exclusive of cover. Even this did not suit me, and so last winter, having a day or two to spare, I went for that chest again. I cut a piece out of the front 10 inches wide, measuring from the bottom and the full length of the chest. I took the slides out and replaced them through the opening just made, and run the drawers on them, after lengthening out the ends, so that they could be pulled entirely out. The piece I cut out was replaced by another a trifle wider and longer, so as to fit snugly. It was fastened at the bottom by two ⅜-inch iron bolts long enough

to reach down through the top of the front into the drawer cover. These bolts are so constructed that when the lid is raised they

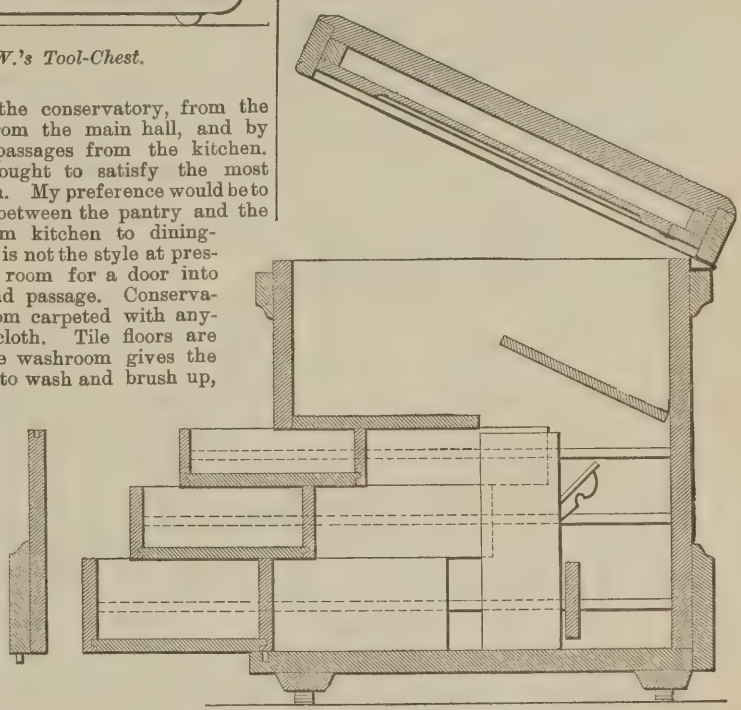


Vertical Longitudinal Section Through S. H. W.'s Tool-Chest.

re thrown up by spiral springs. Inasmuch as the grain of the board ran horizontally in the ends, in order to prevent splitting a piece of band iron crosses the front end of each piece inside of the chest I would recommend in making a new chest of this kind to run the grain vertically. The lid is 3 inches thick with a 1-inch space in it, not for plans, for we fellows do not carry them, but for squares and saws, which are fastened by slipping under a cleat at one end and a button at the other. A lid ½ inch thick covers them, and is hung at the bottom with two hinges and is fastened at the top by a flush catch. The top of cover is formed of one piece. The drawers are respectively 4, 3 and 2½ inches deep. The fronts and ends are of black walnut, and they run on ½-inch strips plowed into the ends of the drawers and into the chest. They work nicely. The lid in front of the drawers can be taken off and slipped under the chest, which is raised 5 or 6 inches for that purpose. The chest itself is made of pine, dovetailed or nailed square, painted, or rather stained, a dark color. The lid is fastened by two locks, one a good tumbler lock, and the other a common spring lock for every-day use. By raising the lid just enough to liberate the drawer bolts it will rest on them, leaving everything accessible.

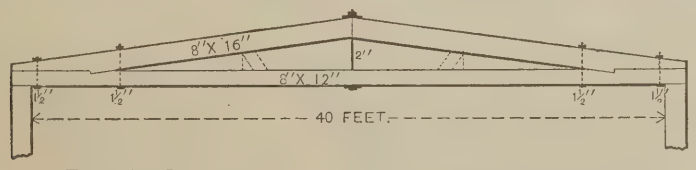
Arrangement of Rooms in 10-Room House.

From Farmer's Daughter.—In answer to "B. W. S.'s" criticism on the arrangement of rooms of the 10-roomed house, published in the April number of *Carpentry and Building*, I would say that well-to-do farmers in this section are fast adopting the plan of tenement cottages, where the farm laborers board with their families, in many cases working the farm on shares. Aside from this I think that few dining-rooms have four entrances, as does the dining-room in question. By turning to the engraving it will be seen that there is an entrance from out-doors through the conservatory, from the sitting-room, from the main hall, and by two different passages from the kitchen. Certainly this ought to satisfy the most fastidious person. My preference would be to run a partition between the pantry and the passageway from kitchen to dining-room, but this is not the style at present. There is room for a door into both pantry and passage. Conservatories are seldom carpeted with anything save oilcloth. Tile floors are preferred. The washroom gives the men a chance to wash and brush up, slip off overalls and put on a respectable coat without troubling the kitchen workers. The main hall might be readily partitioned with drapery, thus giving the passageway from kitchen to dining-room, under main stairs, the privacy of a separate hall.



Vertical Cross-Section Through S. H. W.'s Tool-Chest.

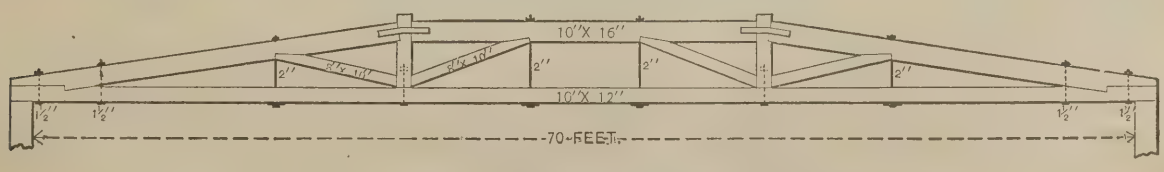
Any one liking the plans alluded to, and preferring the mother's-room for a dining-room, would simply have to change the position of wash and store rooms with pantry and dish-closet, but it seems to me the loss incident to this change would exceed the gain in many ways. An elderly lady, the mother of a family of boys, and who had lived for many years on a farm, lately said to me: "I want my dining-room to be one of the pleasantest rooms in the house, for here I pass more time at meals with my boys than anywhere else." The dining-room in the house in question being octagonal in shape, with pleasant outlooks, and with a glass door into the conservatory and furnished with an open fireplace, might be made very attractive indeed. Pleasant surprises in the opening of flowers and the growth of plants, together with engravings and pictures of different kinds, judiciously distributed and hung upon the wall, could not fail to make this room full of pleasant memories in the minds of the children of a family as they go out into the world as men and women. Either of the two rooms would make a pleasant dining-room or pleasant mother's-room, yet the change would sacrifice certain privacies that can only be enjoyed by leaving them as at first planned. Hired men, if suitable to sit at the family table, can readily find access to it. A dining room in a house of this character ought to be carpeted, whether the approaches to it are carpeted or not. Further, a table in the kitchen, with plenty of appetizing food, would be quite acceptible to men who would feel more at home there than in the family dining-room. The kitchen is fully as large as this room in the average house, and, with the washroom, a large pantry and spacious closets, is more than ordinarily desirable. A house perfectly planned is not one of the human possibilities, and objections can be raised to the most carefully considered study.



Truss for Roof of 40-Foot Span, Contributed by T. W. M.

Roof Trusses.

From T. W. M., *Peoria, Ill.*—In answer to "J. E. A.," who asked the question in a recent number of *Carpentry and Building*, I inclose some designs for roof trusses, one having a span of 40 feet and the other 70 feet. The drawings so clearly indicate the construction that there is very little need of description. The smaller truss might be extended to a span of 60 feet and in this case more bolts and braces would be required, placed as shown by the dotted lines. The larger truss might likewise be extended to a span of 100 feet, with extra braces and rods added.



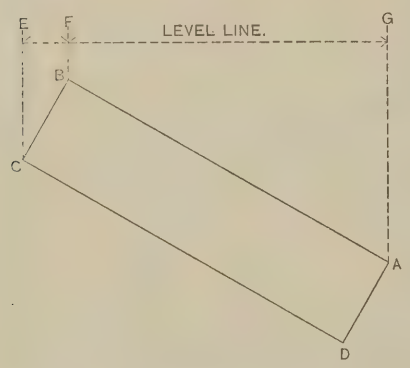
Truss for Roof of 70-Foot Span, Contributed by T. W. M.

Mortar.

From J. E. D., *Baltimore.*—I notice in the August number of *Carpentry and Building* an article from the pen of Professor Sullivan, on mortar. In the course of the article the author says that it is not well understood what causes mortar to bind two substances together. He also asserts that lime acts chemically upon sand. I think the writer is wrong in his statements, as all the authorities whom I have consulted on the subject say there is merely a mechanical action, and not a chemical one, between lime and the sand which is ordinarily used for building mortar. The particles of sand are well coated with a thin layer of lime when the mortar is thoroughly mixed, and by the absorption of carbonic acid from the atmosphere by the lime, which is greatly facilitated by the porocity of the mortar, this also hardens, thus binding the particles of sand together. The connection between this body and the brick or stone of which the wall is composed is effected by the soft mortar being pressed into the pores of the material and hardening there, thus binding the substances together. The sand should be clean and the brick or stone free from dust to make the mortar adhere well. Burnt clay, crushed stone, slag from furnaces, clinkers from brick-kilns, and cinders from coal, where they are quite clean, may be used as substitutes for sand. When hydraulic limes and cements are used the sand weakens the mortar instead of strengthening it, as is the case where fat limes are used.

Soffit Bevels.

From W. B. M., *Waverly, Va.*—I inclose the method I have used in such operations as mentioned by "J. D. R.," of Syracuse,



Soffit Bevels.—Fig. 1.—*Angle of Soffit as Described by W. B. M.*

N. Y. I have found it much simpler than the method commonly employed. It is easy of comprehension and can be applied to any splay, to mitering bay windows that return at right angles, and in various other places.

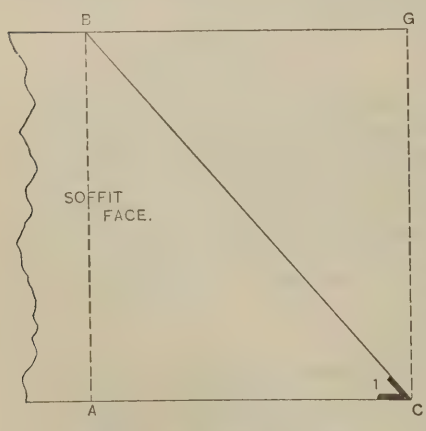
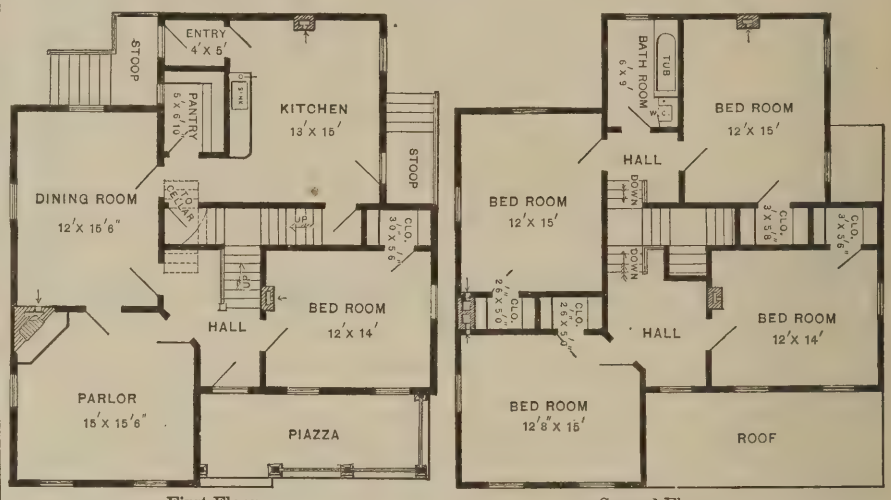


Fig. 2.—Line on Face of Stuff

Lay off the soffit on required angle, as shown in Fig. 1. Then in Fig. 2 lay off B G, equal to F G of Fig. 1. Draw B C. Then let B C A be the bevel for the top or face of the soffit. The vertical will be found as shown in Fig. 3. Lay off on the edge two lines at right angles at a distance apart equal to E F of Fig. 1 Draw C A. Then the angle B A C will be the bevel on the edge. Fig. 4 is a diagram showing both cuts. This method will work at any angle and will do on window as well as on splayed caps, on outside base, on roofing boards and on hips.

Plan of Farmhouses.

From F. J. G., *Leavenworth, Kan.*—I inclose a plan of farmhouse to add to the many that have been already published. Last year



Floor Plans of Farmhouse.—Scale, $\frac{1}{16}$ Inch to the Foot.—Contributed by F. J. G., Leavenworth, Kansas.

I let a house somewhat after the plan inclosed for $2900. The dining-room was placed where the bedroom is shown in the present plan, while the dining-room of this plan was used as a sitting-room. A house after the plan inclosed is now in progress of erection at Fort Leavenworth.

Note.—In a letter from this correspondent, written later than the one above published, he says that he would be glad to see published in our columns different elevations of these plans. If our readers are agreeable to the suggestion we shall be glad to receive studies, with a view to engraving them.

Tool-Chest Handles.

From M. H. J., *Hornellsville, N. Y.*—In reply to the question of "C. S. J.," of Alexander, Md., I would say that I have experienced the difficulty of which he speaks. I find, however, that fastening a 1 x 2 inch oak cleat to each end of the chest, using for the purpose about three 2 inch screws, settles all the trouble. I place the cleat across the panel and dress off the corners with the exception of about 4 inches on each end. The curve of the panel admits the hands. I have sent my chest, which weighs 200 pounds, a considerable distance by rail several times, and it has arrived in good shape. I find handles constructed as described above are easy on the hands, always on the chest, and, further, that they never give out.

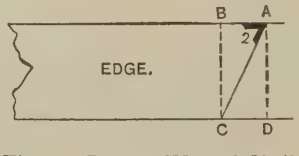


Fig 3.—*Line on Edge of Stuff.*

Painting Shingles.

From C., *Dodgville, Wis* —I desire to inquire if coal-gas tar or paint is of any use on shingle roofs? Is there any danger from sparks if the roof is well sanded?

Answer.—Unless the roof in question is upon an outbuilding or barn, the appearance of which is of no particular importance, we should not be willing to use coal tar as a roof paint. A prepared varnish that is sometimes manufactured from this material is less objectionable than the raw tar obtained from gas works. A roof covered in this manner, after it has been exposed to the air for some time, more especially if sanded, would not be liable to take fire from sparks. As to the advantage of so coating a roof we are somewhat doubtful. We should prefer paint, and if this is applied when the roof is new we think the cost of doing so a good investment. We should prefer dipping the shingles as they are laid, to painting the roof after the shingles were in place. If our readers who have had practical experience in this direction care to answer this correspondent's inquiry further we shall be glad to have communications from them.

Fitting Doors.

From G. S. F., *Concord, N. H.*—I desire to say to "F. A. K.," of Westerly, R. I., that with an experience of 10 years in practical carpentry, I think that in all cases there should be an allowance of $\frac{3}{64}$ inch between the door and the rebate. In order to do a good job in this respect the mechanic should in all cases work from the side next to the rebate. Any variation in thickness of door or depth of rebate from top to bottom will cause the space between the door and rebate to be very uneven. He should set his gauge to work from the back of the door and use a strip of wood $\frac{3}{64}$ inch larger than the door in the rebate when marking for the butts. By being careful in these particulars the workman will be sure of a good job.

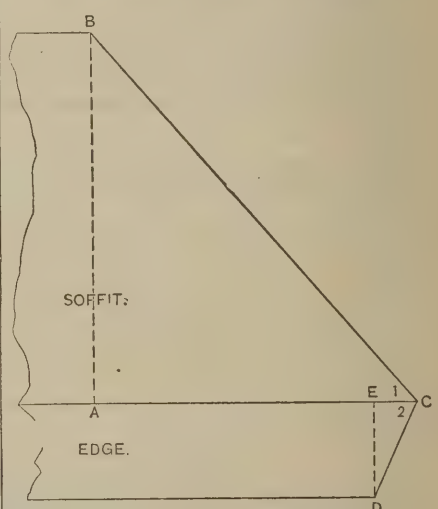
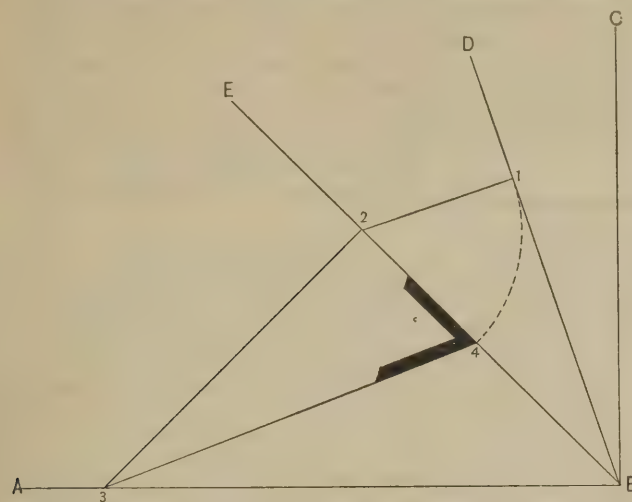


Fig. 4.—Diagram of Face and Edge Combined.

Backing of Hip Rafters.

From W. B., *Ames, Iowa.*—I notice in the July number of *Carpentry and Building* for the current year a letter and diagram from "L. M. S.," Germantown, Pa., on the sub-

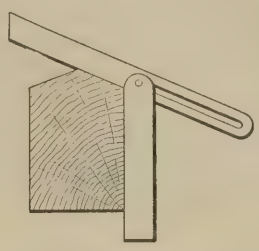
ject of hip and valley rafters. I am disposed to criticise this writer in some particulars. His method is correct until he comes to the backing of the hip—that is, how to find the proper bevel for the purpose. I inclose a diagram which I believe to be correct and easy to work out, and which, perhaps, will be of interest to him and other readers of the paper. A B and B C represent the plates of the building, and B D the hip rafter, B E being the seat of the rafter. Take any point of the hip, as 1. Draw a line at right angles to this, producing it until it cuts the seat B E, as shown in the point 2. From the point 2 thus established draw a line perpendicular to the seat, producing it until it cuts the line of plate A B. Transfer the distance 1 2 along the line representing the seat of the rafter, thus establishing the point 4. Draw 3 and 4; then at 4 will be given the bevel for use in backing the rafter. My second sketch shows the application.



Backing Hip Rafters.—Plan Followed by W. B.

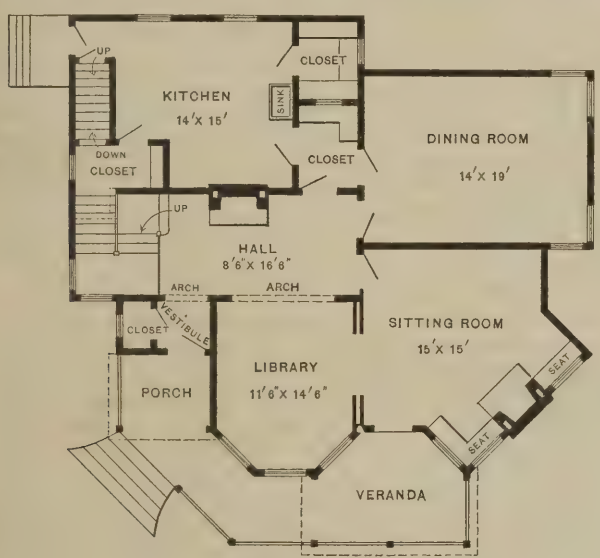
Study in House Planning.

From R. H. C., *Watkins, N. Y.*—I inclose tracings of alternate plans of a house intended to combine at moderate cost many of the excellent features presented in the series entitled "Study in Suburban Architecture," published in the volume of *Carpentry and Building* for 1883. The house is supposed to face the east and to be built upon a slight rise of ground commanding a beautiful view; consequently, I have put the living-rooms in front and have made the depth as slight as possible. The hall, although having a convenient entrance, does not take up any of the front of the house. It contains a fireplace, the same chimney serving also for kitchen and furnace. The stairs are pleasantly located and will have windows upon the landings. I might have arranged sliding doors for the library, but I thought the wider opening with curtains would give pleasanter rooms. On each side of the fireplace in the sitting-room would be a wide window and seat. The front windows would reach the floor and would open upon the veranda. In the second floor five large chambers and a bathroom are provided, and are so situated as to make the plumbing simple. There are doubtless many imperfections in these plans, but if there are enough good points about them to make it worth while laying them before your readers I shall be glad to have you do so. Perhaps some contributor will kindly point out the faults, and possibly some one may be willing to attempt elevations.

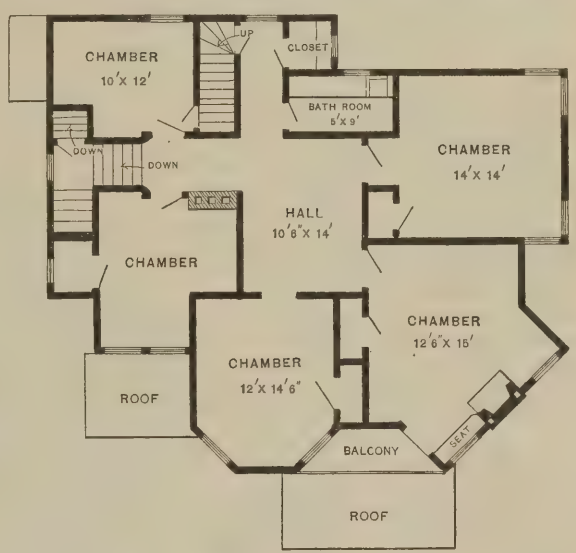


Application of Method Shown in the Diagram.

Note.—We shall be glad to have our readers respond to the invitations above.

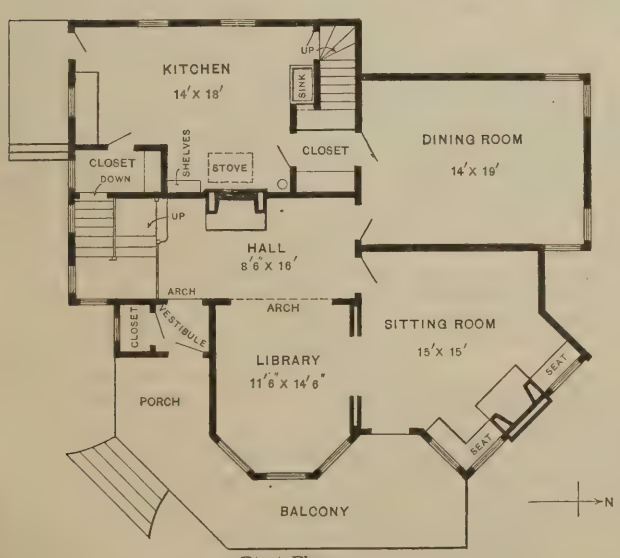


First Floor.

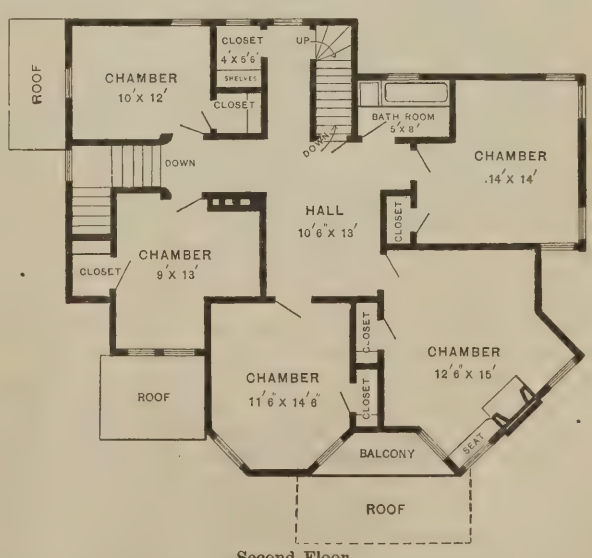


Second Floor.

Study in House Planning.—Floor Plans.—Scale, $\frac{1}{16}$ Inch to the Foot.—Contributed by R. H. C., Watkins, N. Y.



First Floor.



Second Floor.

Alternative Plans by the Same Author, Showing Different Location of Back Stairs, &c.

REFERRED TO OUR READERS.

Hand-Railing.

From J. S., *Riverton, Va.*—The question we desire to propose to the hand-railing correspondents of *Carpentry and Building* may be regarded by some as an easy one. On the other hand, we have at times met hand-rail men who dispute our way of getting at it. Accordingly, we desire to submit it to practical men among the readers of *Carpentry and Building* for the purpose of comparing different solutions. The question is as follows: What is the best and shortest way to get at the molds for a wreath going over a 10 or 12 inch cylinder floor-landing stairs, where the last riser comes in the cylinder and one baluster sets in the center of the same? Suppose the rise to be 7¾ inches high and the treads 9¾ inches wide.

Carpenters' Tool Baskets.

From B. & B., *San Francisco, Cal.*—We desire to learn the address of the manufacturers of carpenters' tool baskets. We are under the impression that such a firm exists in Chicago, but we have never been able to learn the address. The basket we are in search of is something like a soft felt hat doubled up, with two handles.

Note.—If any of our readers are able to furnish the information above requested we shall be glad to have them write us.

TRADE NOTES.

The Millers Falls Company, with factory at Millers Falls, Mass., and warehouse at No. 74 Chambers street, New York, send us a copy of their new catalogue of specialties. The goods shown include Barber's bit brace, made in various forms, hand drills, breast drills, vises, jack-screws, scroll-saws, hollow augers, Goodell's iron level, carving tools, Langdon miter-box, blind openers, carpet stretchers, turning lathes, &c.

Messrs. E. Van Noorden & Co., of Boston, Mass., call attention in another column in this issue to the "Montross" sheet-metal shingles which they are engaged in manufacturing for the United States. We illustrated these shingles in our "Novelties" department several months since, giving the address of the Canadian manfacturers. Messrs. Van Noorden & Co. have secured the American agency, have equipped themselves with special machinery for their manufacture, and now have the goods ready for the market.

The new catalogue of the Egan Company is a handsome volume of nearly 200 pages, profusely illustrated, and printed in good style upon a fair quality of paper. Many of the cuts are larger than single pages of the book, which measure no less than 7 x 10 inches, and therefore are on folding plates. The quality of the cuts may be judged by our readers by inspection of several of the illustrations of their machines which have heretofore appeared in our "Novelties" department. The assortment of machines produced by this company is unusually large, and comprises almost everything that can be named in the wood-working line. It would be impossible to enumerate in this connection all that the work contains. We notice that the catalogues of this company are numbered. This indicates the use of a system which facilitates the record of the volumes sent out and prevents duplication. The cost of preparing a volume of this kind is very great, particularly if a large edition is published, and the freedom with which advertising matter is used at the present time by those to whom it is sent results in unreasonable cost to those who put out catalogues. Hence it is that many who are publishing expensive books at the present time undertake to make their value appreciated by all who receive them. This book is not sent free, but is priced in paper cover at 75 cents, in boards at $1.25, and in cloth $1.75.

Mr Steele Mackaye, formerly of the Madison Square Theater, and more recently of the Lyceum Theater, New York City, is widely known as the inventor of several specialties relating to the equipment of theaters and other audience-rooms. Among his inventions are forms of folding chairs, the use of which greatly facilitate the departure of an audience at the close of an entertainment. The Composite Iron Works, with office at the corner of Reade and Church streets, New York, are the manufacturers of Mackaye's "Safety" opera chairs, two views of which are presented in their card in another column of this issue.

The H. W. Johns Mfg. Co. in another column present a view of their office and factory, and also renew their offer to send their pamphlet on "Structural Decoration" to all applicants. In their card special mention is made of their asbestos paints, which many of our readers have satisfactorily used in the past, and they also refer to various other important lines of goods which they manufacture. Among these may be mentioned asbestos packing for boilers and pipes and roofing felt.

The Garry Iron Roofing Company, of Cleveland, Ohio, in their card in another column in this issue, call attention to the special form of iron shingle which they are manufacturing. This establishment has long been known to many of our readers as the makers of an excellent quality of iron roofing; they have recently added to their assortment of roofing material by the introduction of an iron shingle of diamond form.

The Shipman Engine Mfg. Co., of Rochester, N. Y., have sent us one of their new and enlarged catalogues giving attention to the Shipman engine, scroll-sawing machinery, wood and metal lathes, &c. The greater portion of the publication is given up to detailed descriptions and illustrations of the scroll-sawing machinery. The factory contains over 17,000 square feet of working-room, all of which is devoted exclusively to amateurs' tools.

Berry Brothers, varnish manufacturers, of Detroit, Mich., with office at 96 John street, New York City, have sent us a very handsome specimen of the use of their hard-oil finish. The sample is in the shape of a wire brush manufactured by the Howard Patent Metallic Brush Company, the woodwork of which has been finished with Berry Brothers' hard-oil finish. As a specimen of finish it is very handsome indeed, and thoroughly illustrates the utility of this article. The claims for this material, among others, are that it dries quickly and hard, rubs easily and does not scratch. It makes either a dead finish or brilliant polish, and is not affected by weather or damp. It is adapted for furniture, desks, seats, fine finish in dwellings and public buildings, and also for rustic frames, moldings and similar work.

The Standard Gas Lamp Company, of 411 Cherry street, Philadelphia, with branch office at 108 Liberty street, New York City, announce the purchase of the Dyott patents, together with good-will, patterns and machinery for the manufacture of street lamps, high candle-power gas lamps, and instantaneous system of lighting and extinguishing gas lights in depots, buildings, &c., without the use of electricity. Mr. M. B. Dyott remains with the new company in the capacity of superintendent of construction. This company furnish estimates and full particulars on application concerning their line of manufacture.

From Rowley & Hermance, Williamsport, Pa., we have a copy of the new edition of their classified catalogue of improved wood-working machinery. This is the sixth edition of the work, and a number of important additions have been made since the last was issued. On the title page appear two portraits which, without statements to the contrary, we presume are counterfeits of Mr. E. A. Rowley and Mr. A. D. Hermance, the members of the firm named. Throughout the volume special attention is directed to the patent adjustable journal box named the "Common Sense," which is a leading feature in all the machines built by this concern. Among the new machinery that has been added during the last two years attention is directed to an improved double-edger, a power feed gang ripping machine, self-feeding rip-saw table, power feed variety cross-cut saw bench, 6-inch four-sided molder, sash-sticking machine, mortising machine, tenoning machine, sandpapering machine, double blind-slat planer, blind-style borer, blind wirer, a number of new patterns of wood-turning lathes, and a number of new styles of saw arbors. The catalogue is of the quarto style, printed in two colors on heavy paper, and is a desirable addition to the collection of trade literature of managers of wood-working establishments

We have received a circular of the Western Mineral Wool Company, Cleveland, Ohio, which has been organized to operate under the patents of the United States Mineral Wool Company, of this city. Mineral wool is among the most excellent non-conductors now in the market, and is available for such purposes as protection against frost, deadening of sound, prevention of spread of fire, freedom from vermin, &c. The circular before us contains the significant assertion that 10,000,000 pounds of this material are now in use, sufficient to cover 2,500,000 feet 2 inches in thickness. Several illustrations are presented showing applications of the material, and a table is given of the heat-conducting power of different substances, by which the relative advantages of mineral wool for the purposes specified may be determined.

We have received from the Taft Company, Hartford, Conn., some designs of corner blocks for door and window casings. These are made from solid pieces of wood, from the best selected stock, and are finely finished. Each has embossed upon its face an ornamental design, some of the patterns shown being of the conventional character and others of floral design. These blocks are made of white wood, pine, cherry, oak, ash and walnut. They vary in size, and are made from 1 inch or less up to 1⅛ inches thick, as circumstances may require.

The Raymond Furnace and Mfg. Co., New York City, announce a radical innovation in the way of trade. Their business is that of heating and ventilation, and noticing, as they have in many directions, the annoyance to architects and owners of employing different contractors on different parts of a work, they have determined to enter the field, soliciting lump contracts on heating, ventilating, plumbing and drainage. The advantages that will accrue to owners, general contractors and architects are chiefly in dealing with a house of undoubted responsibility, one thoroughly understanding the different branches of business, and avoiding the annoyance of several contractors whose lines of trade so nearly approach each other as to leave in doubt at times the question as to whom certain parts of the work by right belong. In addition to the departments of trade above enumerated, they also include that of supplying the cooking apparatus which a building may require.

The Syracuse Twist Drill Company, No. 166 Grape street, Syracuse, N. Y., are directing attention to their patent wood-boring drills, which are said to be especially adapted to hardwood and where there is danger of splitting; also for repair work, where many kinds of bits would be spoiled by contact with nails and screws. They work well with the grain and make a straight, smooth hole. The larger sizes will enlarge a smaller hole without previous plugging.

The Fifty-fourth Annual Exhibition of the American Institute, which will open about the time this paper reaches our readers, at the Institute Hall, Third avenue and Sixty-third and Sixty-fourth streets, New York, gives indication of being more interesting than any of its predecessors, if any criterion can be formed from the character of the entries made. These are more numerous than usual. The machinery department will be especially rich in novelties, and some extremely curious devices will be shown in which steam, electricity, gas and compressed air will be the motors.

CARPENTRY AND BUILDING

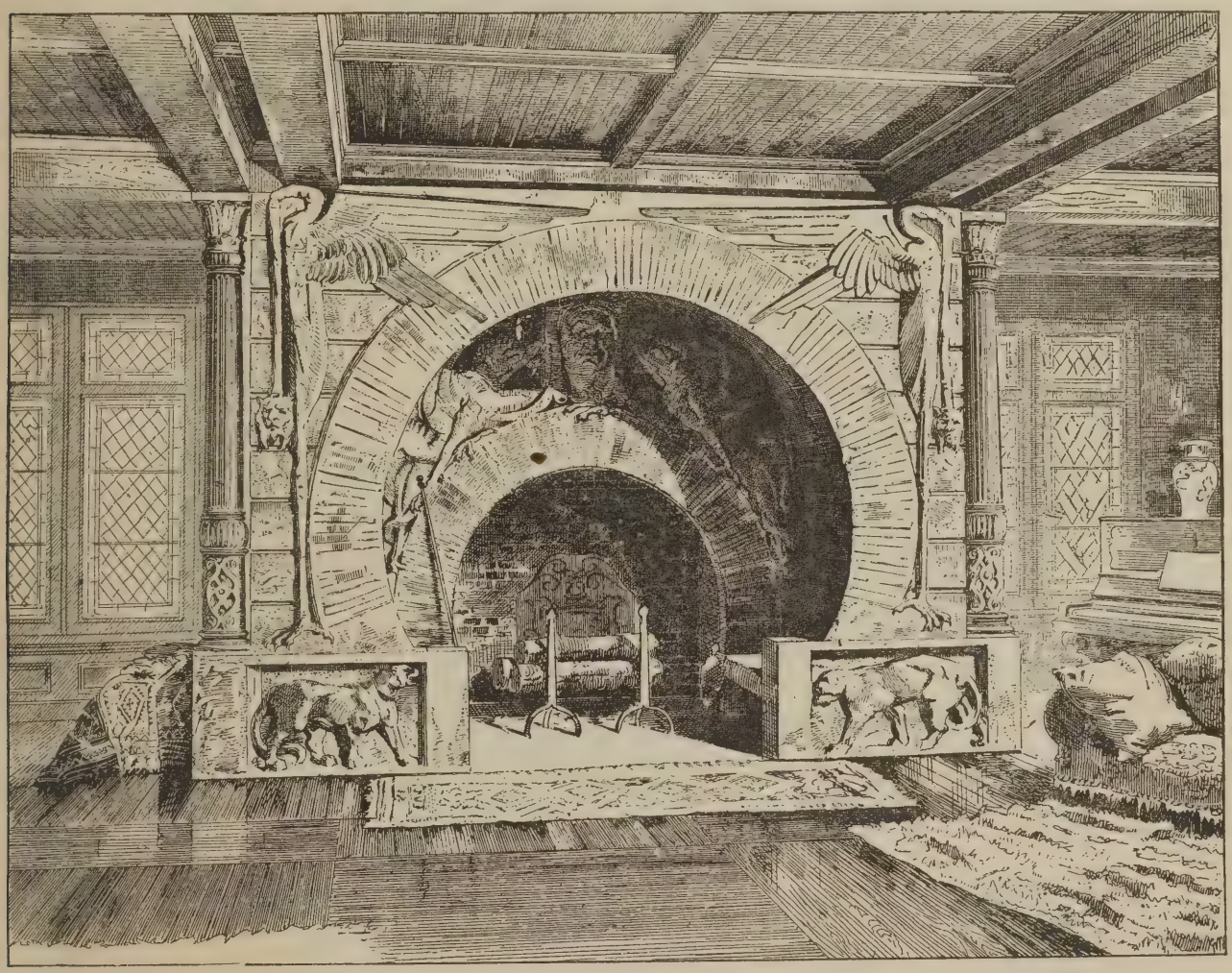
A MONTHLY JOURNAL.

VOLUME VII. NEW YORK=NOVEMBER, 1885. NUMBER 11

Typical Fireplaces.

In a recent issue of the London *Building News* we find engravings of two fireplaces which we have reproduced and show on this and the following page. Accompanying them was a short descriptive article bearing the title "Two Typical Chimney-Pieces, English and American," which we also reproduce below as a curiosity. It will be noticed that our English contemporary rests entirely upon one of its French exchanges, but, by consent, for which we are indebted to M. Lévy, the publisher. The American chimney-piece has been erected in the house of an engineer at New York, who, it seems, has endeavored to embody in the design the power of mechanical force and strength of constructive skill as represented by the form of a railway tunnel, ornamenting his arched spandrels of the fireplace proper with emblematic sculpture, boldly carved, like the tigers on either hand of the chimney-piece. Two composite birds with lions' heads grace panel with the vase niches in the upper part is too overbearing and heavy for the turned balusters and delicately-detailed shafts or columns to support comfortably. The fire-dogs, too, are extravagant, and the billiard table looks, perhaps, too much like a drinking trough or ancient lavatory. This possibly is due to a want of knowledge in drawing it, or the table is a French one."

We have known for a long time that it was the ambition of Boston to be "awfully English, don't you know," but it must have



FIREPLACE IN RESIDENCE OF DR. R. C. GREENLEAF, LENOX, MASS.

J. Ph. Rinn, Architect, Boston.

between the two, things are very cleverly mixed up. The cut on our first page is the one accredited to the New York engineer, while the one on the second page is laid to the charge of some English designer. We have supplied correct captions, which will enable our readers to appreciate the following, being the descriptive article referred to:

"These two chimney-pieces are eminently charactestic, and as recent examples of contemporaneous design are certainly interesting, whatever may be judged as to the merits of each composition. Both as represented here are drawn by a Frenchman, M. G. Garen, and thus are comparatively shown by an impartial hand, the etchings being taken from *Le Moniteur des Achitectes* the façade, so to speak, and their wings, in an odd fashion, decidedly American in idea, boldly run into or overlap the main arch, suggesting a question as to how so thin a veneer of stone is managed, and perhaps why the conceit was carried out at all. Two columns flank the composition and help to carry the ceiling timbers above, while seats or settles are provided on either hand of the fireplace. The English chimney-piece is evidently a recent work, like the last, but its author's name has not reached us, nor has the place in which it is situated been given. The design suggests its purpose cleverly enough, and the seats within the canopied niche look cosy; but the composition is rather overdone, and the tiled majolica-faced

been a surprise to Mr. Chamberlain, the author of the design on the next page, to have his study credited to an anonymous Englishmen. He no doubt greatly relished the delicate criticism of the billiard table and the fire-irons. Boston is the "Hub" of this Western continent, and therefore it is altogether correct that one of her architects should design the typical American chimney-piece, although it was unkind in the Frenchman to credit it to New York when, in fact, it exists at Lenox, Mass.

Our English contemporary loudly praises the impartiality of the draftsman to whom both of these engravings are attributed. The facts of the case are that they are somewhat clumsy copies of photo-caustic prints

which appeared in the *American Architect and Building News*, the first being in the issue for January 31, 1885, and the second in the number for October 18, 1884. As evidence of the entire impartiality of the draftsmen, we may mention that the two "tigers" characterized by our English exchange as "emblematic sculpture" have exchanged places by his assistance. In the original the one with uplifted head is on the right. Other minor details are also variously changed. With the originals before him, as they must have been, from which the engravings were prepared, it would seem that there was no excuse for the editor of the French publication to make a mistake in crediting the designs. Perhaps, however, he had an object in doing so. What it was we leave the reader to guess.

While on this subject we can present some particulars that may interest our readers. Referring to our English contemporary's solemn speculation about the expediency of lapping such a thin veneer of stone over the main arch as would be necessary for the wings of the birds in the first design, we would state that the material of this chimney-piece is not stone at all, and there is no veneer employed, either. The design was executed in terra-cotta by the Boston Terra Cotta Co., the artist employed upon this particular piece of work being Mr. T. H. Bartlett.

Concerning the *motif* of the designer our English exchange is about as far wrong as it possibly could be. The idea originated with a lady, the wife of a physician, instead of an engineer, as stated, and her intention was anything but that of typifying "mechanical force and strength of constructive skill." Mrs. Greenleaf desired to have in the large room in which this chimney-piece occurs a fireplace that would answer in utility and at the same time be something in design and ornamentation, at once amusing and altogether away from the conventional. At the outset she caused to be built of brick a projecting structure in front of the chimney, running from floor to ceiling and extending out into the room. About midway of the depth of this structure, and on opposite sides, were inwardly projecting walls reducing the width of the opening, which joined at the top in the form of a rude arch. Upon this foundation or skeleton she requested that something be put displaying hideous animals, worms and creeping things. Another condition was that the work should be executed in terra-cotta, so that it should represent the modeler's effort direct, and not be a reproduction by a stone-carver. Mr. Bartlett submitted a sketch which was approved. It passed to the decorator who was arranging the woodwork for such minor modifications as were necessary to make everything in the room harmonious, and finally the work was done. The result was as shown in the engraving, with the exceptions we have noted. Contrary to the ideas of our contemporary, the design has no symbolic or representative character in any respect. Neither does it serve any literary, moral or illustrative purpose. Its object was the gratification of a whim—or, more correctly speaking, the personal amusement—of the lady of the house. If any name can be given to the creatures that crawl and writhe on the surface of the inner face, it is that of "chimeras." The birds on the front face more nearly resemble storks than anything else of the bird kind with which they can be compared. Their heads, however, are very unlike storks' heads, and serve the useful purpose of bosses or rosettes for the gas fixtures which project through shem. These are not shown in the engraving. Altogether the idea is "decidedly American," but in a very different sense from that in which the term is used in the extract above. The two animals in *bas-relief* are enlarged copies from the work of a celebrated animal sculptor. The blocks in which they occur are of black marble, this part of the work in color being in happy contrast with the rest, which is in red terra cotta.

The following are the principal dimensions of the work, the technical difficulties of making which were considerable: Face width, 16 feet; hight, 12 feet; depth, 9 feet; distance between faces, about 3 feet; hight of inner arch, about 6 feet. The room in which the work occurs is 40 x 40 feet in size. We might present still further particulars, but they are scarcely necessary. We do not hope to set either of our contemporaries right, and very possibly they do not care for such service at our hands. We simply lay the matter before our readers as it is, because altogether it is an amusing incident.

BILLIARD-ROOM IN RESIDENCE OF MR. FRANK A. KENNEDY, CAMBRIDGE, MASS.

W. E. Chamberlain, Architect, Boston.

Value of the Forests of Alaska.

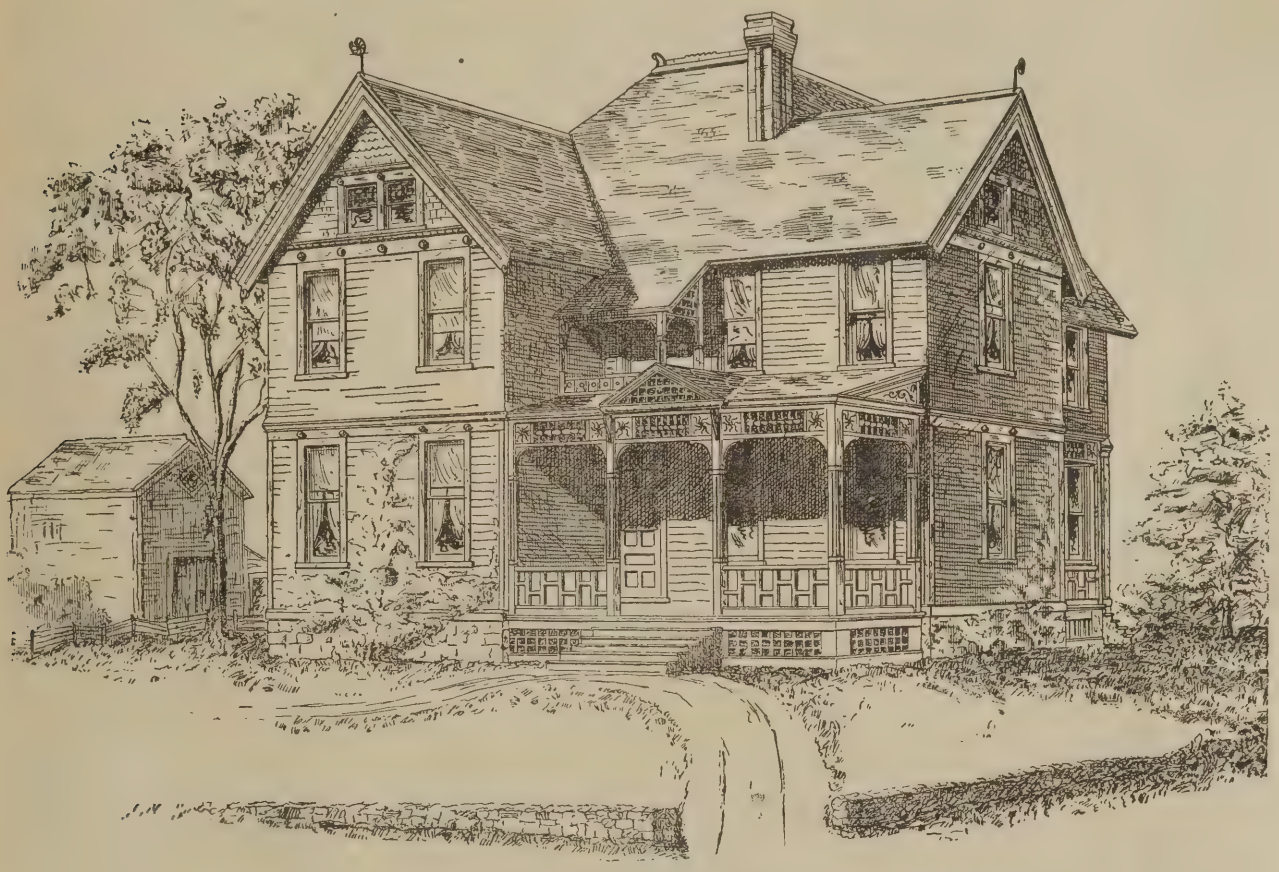
Ever since the purchase of the Territory known as Alaska, from Russia, during the War of the Rebellion, the question of the value of the possession to our Government has come up periodically for consideration. Those who have visited this far-off region in the interval have given various accounts of its resources, including its mineral deposits and fisheries, and describe what the fur and trading companies are doing. Without losing sight of the profit to be derived from mining and the industries based on fishing and hunting, it would seem that the great forests of that country are, after all, likely to prove the most important. According to the San Francisco *Chronicle*

the forests of Alaska contain enough timber to supply the world. The forests of pine, spruce, fir and hemlock cover every island of the archipelago and a goodly portion of the mainland. The trees are straight and tall and grow close together. The only sawmill at present in operation is at Douglas Island, and so far there has not been a cord of timber cut for shipment. The trees, as a rule, do not always cut up into good-sized boards. For fuel, however, the wood is excellent, and much of it is available for building purposes. There is little decorative wood, although the yellow pine is richly colored, and might be used to advantage in inferior work. Alaska spruce is an excellent variety and often measures 5 feet in diameter. It is considered the best spruce in the world, and the supply is very abundant. In the interior of the country timber is of much heavier growth than on the coast and on the islands. Regarding the hemlock there is a large supply, and the bark compares favorably with that of the Eastern tree in tanning establishments. No one has yet attempted to compute the value of the Alaska forests. It may be they will not be necessary for years to come, but whenever wood grows scarce elsewhere, or whenever civilization fastens itself upon Alaska, the timber of the region will be found ready at hand and existing in rich profusion. Calculating only approximatively the value of our possessions to-day, the forests must be considered. Practically inexhaustible, they add most materially to the wealth of the Territory.

More than 300 years ago an English historian gave the following description of a sawmill: "The sawmill is driven with an upright wheel, and the water that maketh it go is gathered whole into a narrow trough, which delivereth the same water to the wheels. This wheel has a piece of timber put to the axle-tree end, like the handle of a broch, and fastened to the end of a saw, which, being turned by the force of the water, hoisteth up and down the saw, that it continually eateth in, and the handle of the saw is kept in a rigall of wood from swerving. Also the timber lieth, as it were, upon a ladder, which is brought by little to the saw with another vice."

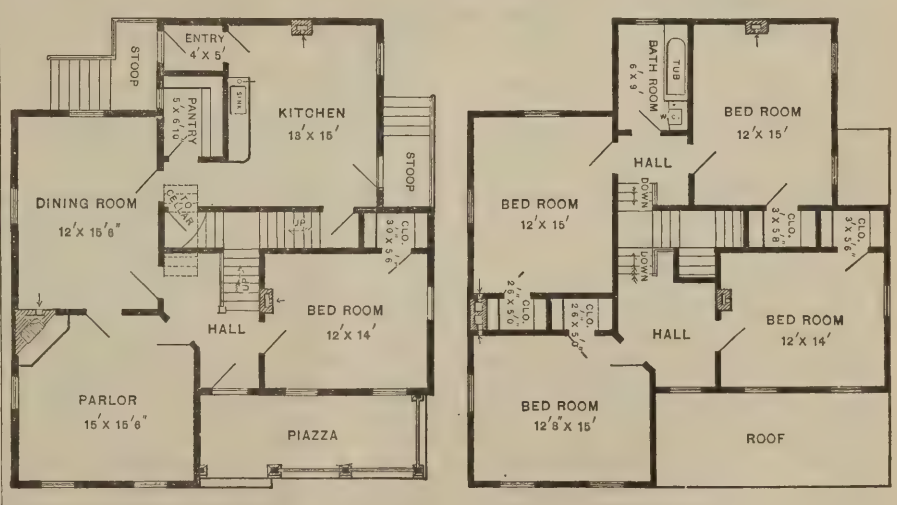
Study in House Designing.

In our last issue a Western correspondent, "F. J. G.," in submitting floor plans for a farmhouse, coupled with his description the request that readers of the paper should present sketches showing how the proposed building might be treated in the way of elevations. The first to respond to this invitation is Mr. J. H. Seeber, of Oswego, N. Y., whose study we have the pleasure of showing on this page. Our engraving is a direct reproduction from his drawing. We have brought forward the floor plans to which it refers, and print them also herewith, so that the study is before the reader in its complete form. We hope to have still other suggestions from our readers in this direction. We are promised a photograph of the building as it was erected to "F. J. G.'s" drawings, which, if received, we shall engrave and thus give additional interest to the general question. Mr. Seeber's design is attractive, and in the absence of particulars of the nature of a specification we shall not attempt to criticise it.



Study in House Designing to Floor Plans by F. J. G., Published in Our October Issue.

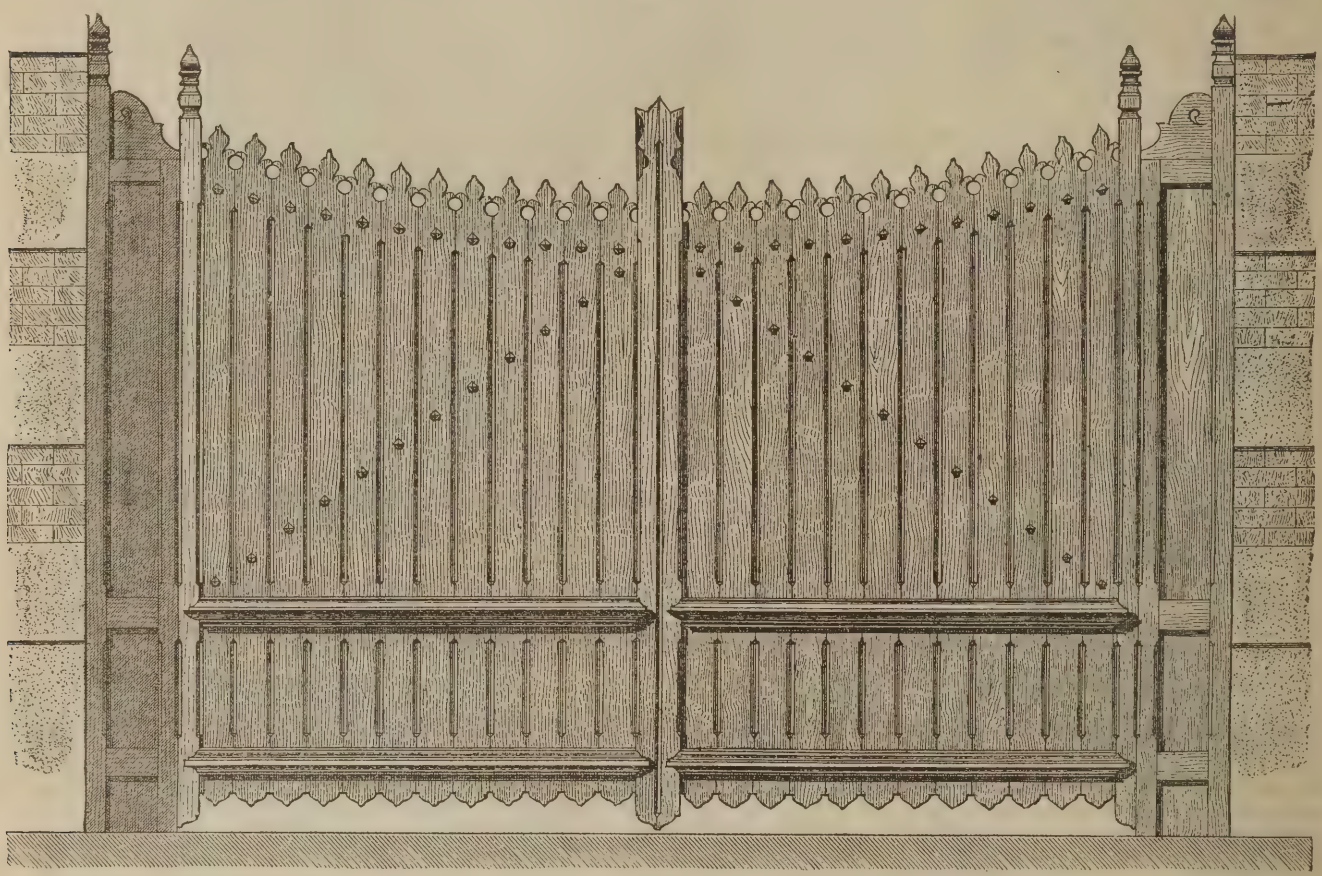
The plans prepared by Mr. Geo. A. Clough, of Boston, have been selected by the Court-house Commission of that city for a new courthouse to be put up on Pemberton Square. A notable feature of the building is the system of inner courts arranged to give light and air. The building, as it stretches out to right and left of the center pavilion, will be three stories high, with flat roof. There will be six entrances, the "Black Maria" entrance included. Corridors extend around the interior of the building similar to those in the new United States Courthouse.



F. J. G.'s Floor Plans, Scale, $\frac{1}{16}$ Inch to the Foot, as Published in Our October Issue, to which the Study Above Refers.

Design for a Double Gate in Wood.

The accompanying design of a Double Wood Gate is by a French architect, and is adapted for use in many places about country residences, and in some instances about town buildings. The design is attractive and at the same time employs the wood in a manner to obtain the best results. The pieces composing the general surface of the gate are narrow, and are stop-chamfered along their edges before joining. The shape of the upper ends of the pieces is such as to be of convenient production in making the gate, while at the same time there is comparatively little chance of fractures on account of the wood breaking with the grain. These remarks apply with still more force to the finish of the lower end pieces. Moldings across the lower end, and nearly one-third the distance up from the bottom, give relief to the general surface, while the heads of the bolts by which the pickets are fastened to the framework of the gate are also so



Design for Double Gate in Wood, by M. Limet, Chalon, France.

managed as to contribute to the general design. Various modifications of this design will no doubt suggest themselves to our readers, thus adapting it in its leading features to use in various places.

NOTES AND COMMENTS.

Among the records of modern practical philanthropy, the establishment of funds which are to be used in helping workingmen to help themselves is attracting deserved attention. One of these, an account of which has recently been published, is at Havre, France. The details of this scheme differ somewhat from the usual plan, and accordingly an account of it may be of interest. The first step was to incorporate a company. The capital was placed at $40,000, to which the city added $5000 as a gift. A rule was adopted, says an exchange in giving an account of this scheme, to the effect that 4 per cent. interest on the investments of the company should be the maximum demanded or expected, and the directors proceeded to begin building operations on this basis. A quantity of land was procured and divided into lots varying in area from 1000 to 1300 square feet, and houses were built, each being about 16 x 20 feet in plan outside the walls, and two stories high. The entrance story was divided into two rooms, one 14½ feet by 11 feet, and the other 7 feet by 8½ feet, the stairs and hallway occupying the remaining space. The second story was divided in the same way. A garden was left behind each house, containing 500 or 600 square feet of ground, and a yard in front of about half this size.

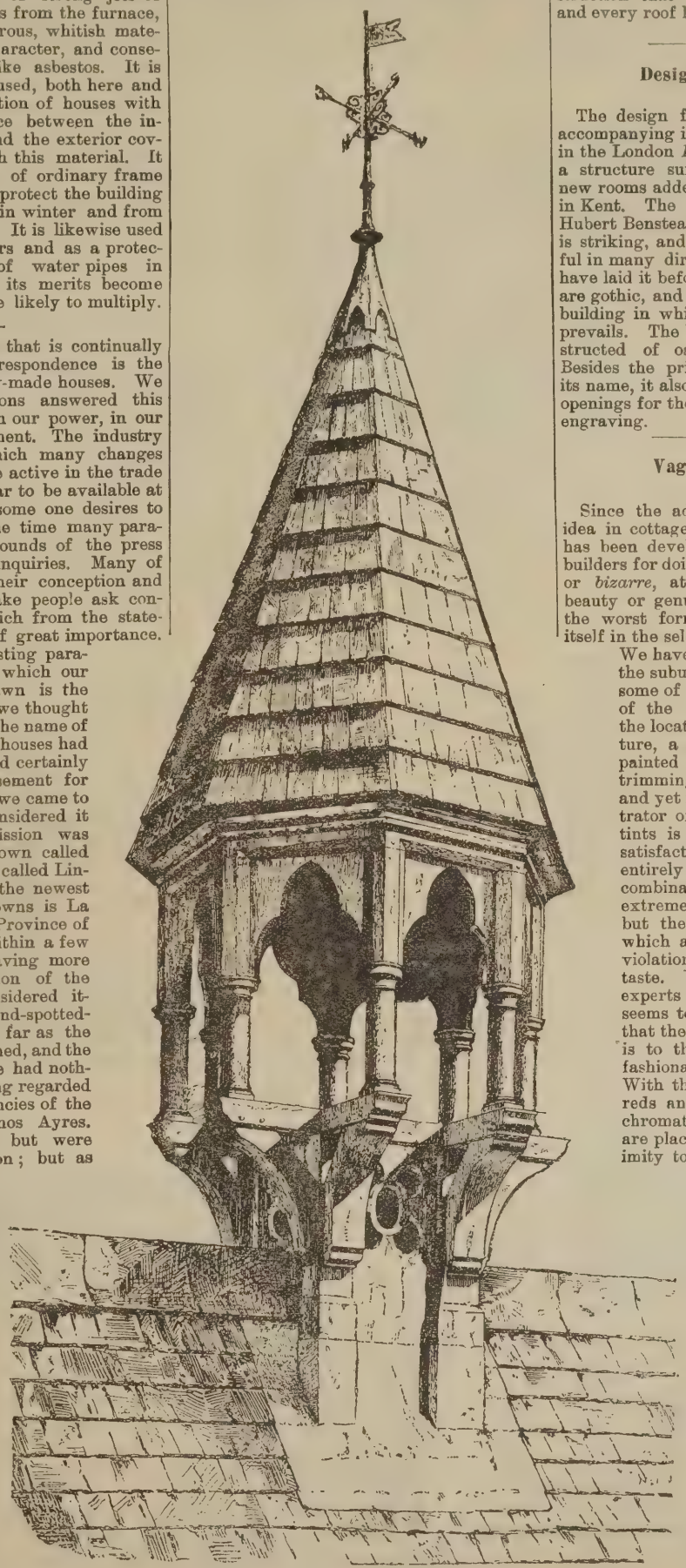
This was not, it is true, a very extensive establishment, but it was large enough to shelter a good-sized family comfortably and decently, and to accommodate an immense amount of domestic virtue and happiness; and the whole affair, ready for occupancy, cost less than $600, including the price of the land. The houses were built in pairs, for the sake of economy, and were rented for $60 a year, with the agreement that the tenant who paid his rent rent regularly for 15 years should become the absolute owner of his house. The rent was nominally divided into two portions, $42 being regarded as rent simply, and the remaining $18 as a sinking-fund payment, and it was provided that in case any tenant should wish to give up his house, or should fail to pay his rent, the amount of his contributions to the sinking fund should be returned to him, with interest at 3 per cent., after deducting the expenses incident to the change of tenants. In this way the company was sure of its money, since each tenant always had a sum on deposit sufficient to cover any loss likely to occur under good management, and it could afford to give its tenants the advantage of the lowest rates of interest. In case a tenant wished to anticipate his payments he was encouraged to do so by an allowance of 5 per cent. interest on all sums paid before they were due. When matters of this kind are clearly explained to them, workingmen, even of the poorest class, are often as intelligent in trying to save a few cents of interest as any millionaire bank president could be, and at Havre the amount of antic-ipated payments has been so great that, although the company was only incorporated in 1871, 56 out of 117 houses which it has built have already become the property of their tenants, and about 20 more will very soon be finally transferred.

In many houses in both city and country illy-constructed chimneys or those near higher elevations and other local obstructions give much annoyance because they will not draw. Where the defect is radical there is no other way to remedy it than reconstructing, or at least extending the chimney higher. In the great majority of cases, however, difficulty is only experienced when the fire is first built. It is more especially manifest in damp and muggy weather. Where soft coal is used the nuisance of a smoky chimney is unbearable. Not only are the fumes oppressive, but the walls of the house are quickly ruined. In many cases of this kind an easy remedy is at hand. Whether the difficulty be smoke or gas from a stove, it may be frequently removed by burning a newspaper lightly crumpled, or a handful of shavings placed on top of the coal in the stove before the fire is lighted. The theory upon which this remedy is based will be at once perceived when it is remembered that the chimney when in work contains a column of heated air. The air in the chimney being lighter than the outside atmosphere, it is forced up by a corresponding column of atmospheric air pressing into the entrance. The oxygen in the air is consumed in producing combustion of the fuel, and the hot gases resulting are constantly pressing up the chimney to find their equilibrium in the light air far above the surface of the ground. When the chimney is filled with cold air this displacement cannot suddenly take place; hence, until the draft is established in the chimney, the smoke finds its way into the house, filling the house with its disagreeable fumes. A light, quick blaze, established by the means we have suggested, will very often create a draft that will facilitate the kindling of the fire.

What is known in this country as "mineral wool" is called in England by the term "slag wool" or "silicate cotton." The latter term is given it from its resemblance to cotton wool. The first attempt at the manufacture of this material dates as far back as 1840, when it was produced by Edward Parry in Wales. Its qualities for various purposes were not early appreciated, though, and it is only recently that it has come into very general use. The production of slag wool

and the industrial applications of the article at present appear to be largely on the increase. Its manufacture is very simple indeed. By the action of strong jets of steam the slag, as it flows from the furnace, is transferred into a fibrous, whitish material that is mineral in character, and consequently incombustible, like asbestos. It is largely and extensively used, both here and abroad, in the construction of houses with mansard roofs, the space between the interior lath or covering and the exterior covering being filled in with this material. It is also used in the walls of ordinary frame houses. The effect is to protect the building from the rigor of frost in winter and from intense heat in summer. It is likewise used for the deadening of floors and as a protection against freezing of water pipes in various situations. As its merits become better known its uses are likely to multiply.

One of the questions that is continually coming up in our correspondence is the source of supply of ready-made houses. We have on several occasions answered this question, so far as was in our power, in our Correspondence Department. The industry seems to be one in which many changes occur, and those who are active in the trade at one time do not appear to be available at some future time when some one desires to find them. At the same time many paragraphs are going the rounds of the press which cause floods of inquiries. Many of these are ingenious in their conception and are well calculated to make people ask concerning an industry which from the statement would seem to be of great importance. One of the most interesting paragraphs of this kind to which our attention has been drawn is the following. In reading it we thought it was unfortunate that the name of the firm furnishing the houses had been omitted, for it would certainly prove a great advertisement for them. However, when we came to the last sentence we considered it fortunate that the omission was made: "There is a town called Washington and another called Lincoln in Argentine, but the newest thing in the way of towns is La Plata, the capital of the Province of Buenos Ayres. Until within a few years that Province, having more than half the population of the entire country, has considered itself horses-and-driver-and-spotted-dog-under-the-wagon, so far as the Government was concerned, and the outlying Provinces have had nothingto say about it, being regarded as insignificant dependencies of the city and State of Buenos Ayres. They tried to secede, but were whipped into the Union; but as immigration has come into the country the other Provinces now outnumber Buenos Ayres, and she is doing the kicking, and in every Presidential campaign the contest comes on a geographical issue. Roca, the present President, was an outside man, and the Buenos Ayreans were going to prevent his inauguration or overthrow his Government, but to mollify them he announced a great scheme of building a new capital at Government expense. There was not time to lay out a town site and let it grow up in the ordinary way, so the President sent to the United States and had 500 houses manufactured to order and shipped down here, all ready to put up, like a box of toys. A location was selected on the *pampas*, all the revolutionary leaders were let into the speculation, war was averted, and a brand-new city sprang up on the prairie, like a bed of mushrooms, almost in a single night. Two or three millions of dollars were spent by the Government, but the President considers that the cost of the town was much less than would have been the cost of the war that was averted; plenty of money was put into circulation, all the laboring men in the country got employment, and, as in the old-fashioned story books, everything came out happily at the end. These houses were made in Brooklyn and Chicago. A New York firm got the contract. There was so much haste and carelessness in their construction that they don't wear very well, and every roof leaks like a sieve."



Design of Combined Bell-Cot and Ventilator.

Design for Bell-Cot.

The design for a Bell-Cot shown in the accompanying illustration recently appeared in the London *Building News*. It represents a structure surmounting the roof of two new rooms added to the Sissinghurst Schools, in Kent. The design was prepared by Mr. Hubert Benstead, of Maidstone. The design is striking, and is of a character to be useful in many directions, and accordingly we have laid it before our readers. Its features are gothic, and it would harmonize with any building in which this style of architecture prevails. The bell-cot in question was constructed of oak, covered with shingles. Besides the primary purpose indicated by its name, it also served that of a ventilator, openings for the latter being apparent in the engraving.

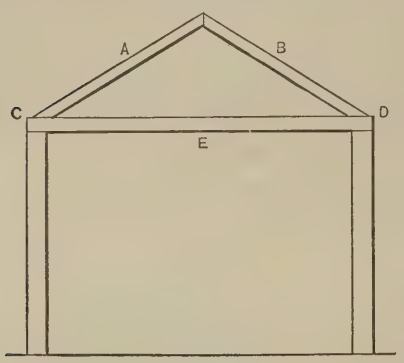
Vagaries in Color.

Since the advent of the modern antique idea in cottage building, a surprising mania has been developed among architects and builders for doing something original, unique or *bizarre*, at whatever sacrifice of real beauty or genuine artistic effect. Perhaps the worst form of this craze has shown itself in the selection of tints for exteriors. We have seen in a lovely village in the suburbs of Boston, surrounded by some of the most exquisite creations of the architects, who have made the location a center of art and culture, a house the body of which was painted a glaring ultramarine, the trimmings black and the roof yellow, and yet it is probable that the perpetrator of this nightmare of primary tints is puffed up with pride and satisfaction for having invented an entirely original conception in the combination of colors. This is an extreme, and we hope a solitary, case, but there are hundreds of cottages which are only less glaring in their violation of all rules of harmony or taste. With a large class of pseudo experts in these matters, one rule seems to be settled upon, which is that the more repulsive a given color is to the uneducated eye the more fashionable and æsthetic it must be. With this dogma in view the Indian reds and sage greens and the whole chromatic scale of muddy brindles are placed in most incongruous proximity to each other by the architect, and are pronounced "just too lovely" by the "culchawed" and æsthetic members of the household. While the failures and shortcomings of these decorative artists are easy to point out, it is not easy to formulate rules by which our dwellings shall be made beautiful and attractive. A cottage in an open situation exposed to the sunlight should be in most cases painted in dark tints, while a house in the shade requires the relief of light and warm colors. As a rule the tertiary colors in different shades will be found to harmonize best with each other and with the average environment; and if any general formula could be suggested which would be safe to follow in a large proportion of instances, it is that the body of the house should be comparatively light, the trimmings a darker shade and the window blinds a still darker tone of the same color. A good effect may be given by painting the sashes the same color, but darker yet. By this system the harmony

will be perfect, whatever the color selected; and if the rule is followed there is a wide choice of colors which may be used with good effect. If the trimmings are to be picked out with some strongly contrasting tint it should be used sparingly—the less the better. If you want something done outside the rules, something unique and striking, employ an artist, and not a butcher.

Retrospective View of Carpentry.

In one of our exchanges a writer presents an historical view of the art and practice of carpentry which cannot fail to interest our readers. The article referred to is as follows:



Retrospective View of Carpentry.—Fig. 1.—Diagram Illustrating the Thrust of Rafters

After all that has been written on this subject it seems almost superfluous to add more; still, a *résumé* of what progress the art has made since timber first entered into construction may be interesting to our readers. It may set them thinking of what has been done in the past and what may be done in the future, for we all know that though the science of carpentry has greatly advanced it has no settled limit, and invention and improvement will go on for ages yet. The object of this paper, therefore, is to stimulate those who are now almost satisfied that perfection has been attained, and to encourage young and ambitious mechanics and students of architecture. The knowledge of "carping" or "kerfing" timber for construction purposes has been proved to have existed in the earliest ages of man, and ancient and Biblical traditions tell us of its use for engines of war, vehicles, tools and ships. It is reasonable to suppose, after a due consideration of these statements, that they are true, for the use of metals was comparatively unknown, and wood, being above ground and easy to handle and shape, besides being strong and lasting, our progenitors instinctively saw its adaptability for their purpcses. Unfortunately, through ancient relics having been altered with each remodeling, necessitated by the natural decline of the material, no true specimens remain to show us the methods they used in joining their timbers to obtain strength and durability. We must only conclude, then, after considering the suppositions put forward by antiquarians, that the beams were laid on the walls and carried horizontally across the building on stone columns or wooden posts, the floor or roof covering being laid on top, and the roofs being flat and covered with tiling. This system was adhered to up to the time of the Romans, when the introduction of the arch compelled builders to use their ingenuity, owing to the circular form of the arch calling for some temporary structure to carry the *voussoirs* until the keystone was inserted, these centers being, undoubtedly, of timber strongly framed and braced and the joints secured by treenails driven vertically through them.

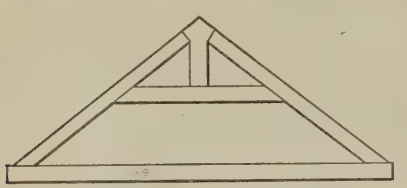


Fig. 2.—Open Timber Roof on Church at Caen, France.

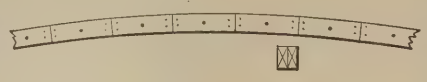


Fig. 4.—Introduction of the Arch in Timber Construc ion.

The raising of the roof to coincide with the pediment likewise caused an innovation; and here we discover the reason why the Romans built their outer walls so enormously thick, on account of their being liable to spread and overturn from the tremendous leverage exerted upon them by the rafters. This will be at once understood by referring to Fig. 1, where the two rafters A and B, being fixed at the points C and D, will, if weighted, naturally thrust the walls out provided they are incapble of resisting the strain; but by stretching a tie-beam across the wall (as E) and notching the rafter ends into it, instead of bearing directly on the walls, we have a truss in its simplest form, and obtain a self-sustaining roof, exerting only a downward pressure. This is the beginning and principle of all angular framing. In bridges and other engineering works of the Romans carpentry played an important part, not alone in centering, but in forming tools to facilitate the work. Following the progress of architecture in Italy, we consider the use made of this important art by the famous architects of that country, as, for instance, in the magnificent domes of St. Peter's at Rome, and the Cathedral at Florence, the great dimensions of which compelled them to use elaborate centering and scaffolding to support the vaulting, and thus we conclude that these great men were thorough carpenters as well as perfect artists and constructors. But it is to the Gothic architects that we are indebted for the great progress of carpentry and for the introduction of those essenti ls now in use. The highly pitched and open roofs demanded additional improvements, so they supported the principal rafters with struts, inserted the hammer-beam and king-post, added the purlins, invented the tenon and mortise, and, better still, fastened their joints with wedges, draw-pins and straps, still, on a geometrical principle, retaining their structtures in perfect equilibrium. In Fig. 2 will be seen an open-timbered roof which covered a church in Caen, France, and which Tredgold states is one of the earliest examples extant. It consisted of a tie-beam, two principal rafters and a stay-beam intended to prevent the principal rafters from bending under their load. They also combined the two branches of carpentry and joinery by profusely decorating their roofs in order to obtain a pleasing effect without decreasing the usefulness of the timber. The roof illustrated in Fig. 3, clearly of later date than the former figure, though evidently defective in framing, shows this combination.

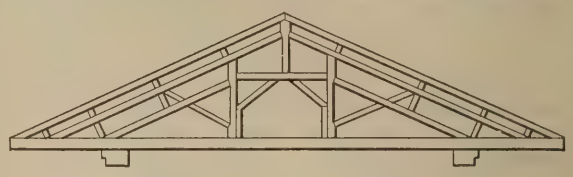


Fig. 5.—Roof of St. Paul's Cathedral, London.

During the whole progress and different changes of the Gothic, carpentry made great strides, especially in the "perpendicular" style, where the use of rich moldings, perforated tracery, carving, &c., of the cleverly designed and constructed roofs brought it to the fore, and made it a prominent feature for increasing the interior appearance of the building. In the sixteenth century Philibert Delorme introduced the arch for the first time into timber structures by using a series of arched ribs in place of angular trusses, these being formed of short lengths placed edgewise, bolted together and breaking joint (Fig. 4). This system has been largely used since, though it involved great labor and waste of material, and was not satisfactory until Colonel Emy, in 1817, saw these faults, and conceived the idea of turning the planks on flat, and bending them on templates to the required curve of the arch, holding them together by iron straps. The pitched roof was supported by struts reaching from the extrados, carrying the principal rafters, which in their turn sustained the purlins, rafters and covering.

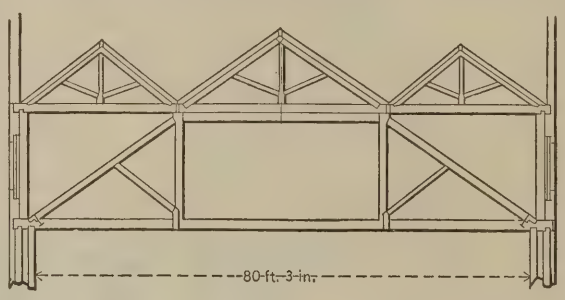


Fig. 6.—Double Compound Truss in Roof of Drury Lane Theater.

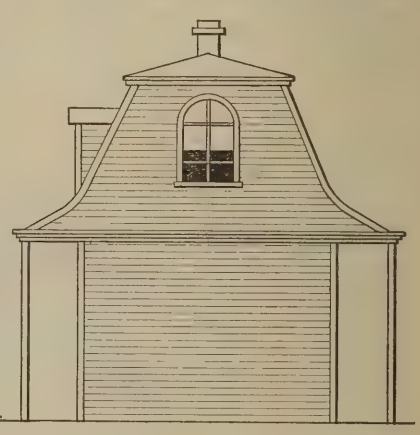


Fig. 7.—Typical Story-and-a-Half House.

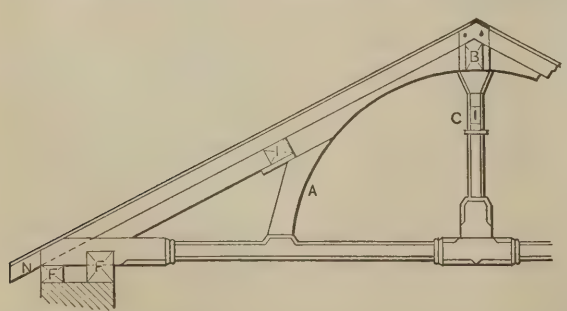


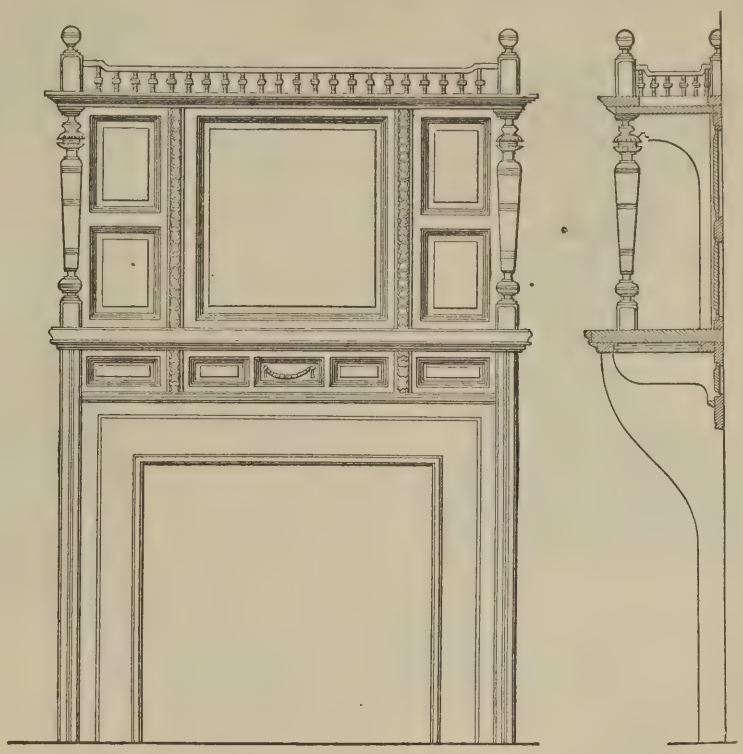
Fig 3.—Roof Illustrating Combination of Carpentry and Joinery.

Let us now return to the triangular principle and consider what has been done for it in later days. We will take, for example, the roofs of St. Paul's Cathedral, in London, and Drury Lane Theater, in the same vicinity. The former (see Fig. 5), designed in 1796, to replace the one built by Inigo Jones, is worthy of mention, owing to the double truss intended to relieve the weight on the projecting ends of the tie-beam, the old one having pressed them down; the latter (Fig.

6) is a double compound truss of 80 feet span, the lower consisting of a queen-post truss framed of large timbers, and the upper of three simple king-post trusses, each of which, resting on an upper tie-beam, spans the three divisions of the lower. Each part is fulfilling its purposes, and were there two diagonal braces between the queen-posts the roof would be almost perfect. Nearly all roofs of 25 feet span and over are framed on this principle, and of late years it has been adopted for long spans of roofs, railroad bridges, truss girders, &c., though in an improved form, as a Howe truss, or combined with the laminated arch as a low suspension truss. It might be remarked here that, on account of its great strength, this system was used by Watt and other eminent engineers in their engine frames. In no country in the world has this art made more progress than our own; not only is this due to the almost universal use of wood in building construction, but also to our architects in order to satisfy the popular taste following the grotesque styles of the Middle Ages, which call forth much study in framing and raising the complex frames and roofs, generally with many corners and consequent hips and valleys. There seems to be no settled method laid down to find the lengths, cuts, &c., and the carpenter frequently has his patience and mental powers taxed to their utmost in laying them down from drawings.

Looking back to old Colonial times and the earlier days of the Republic, we find from the remaining buildings of that period the whole five classical orders reproduced in wood, the Ionic and Tuscan predominating, the colonnade of five or six columns with entablature forming the piazza. These contrast strongly with the cramped, low-roofed piazzas of the modern Queen Anne, and make one sigh for the old times and imposing houses which were architectural in every sense, not only in design, but also large, airy and well and solidly built by hand, from felling the tree to fixing the moldings. We likewise find the cheaper class of one and one-half story houses, with their peculiar roofs reaching over the piazzas, generally shaped as shown in Fig. 7. The similarity between this form, once extensively used, and the modern mansard is striking, though it is probably a coincidence.

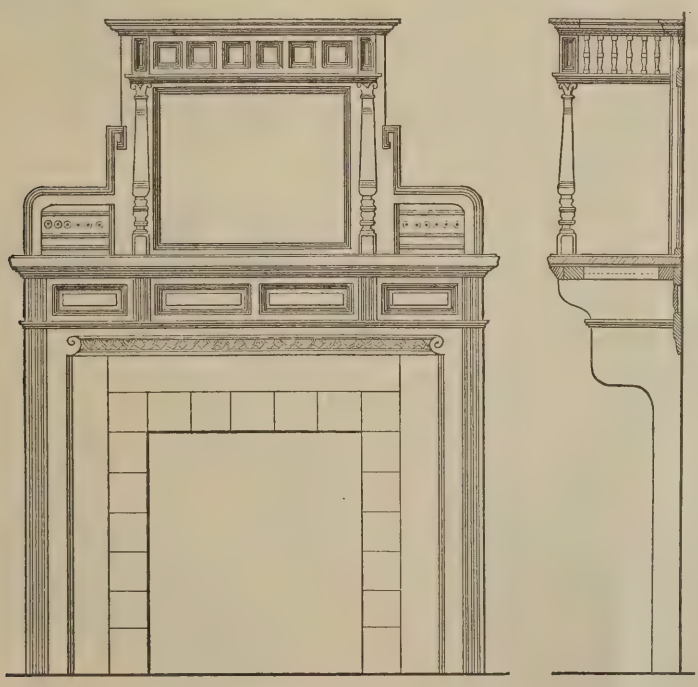
The absence of iron in quantity at one time allowed the carpenter to have full scope, and time was when he was invaluable. In late years, however, the more compact and stronger material has come in vogue and driven timber from the field of construction, especially in large works where rigidity and lightness are required, but carpentry is still an art in spite of all that is said to the contrary, and its modern varieties demand even more skill than in bygone days. Let us not rest satisfied with the labors and studies of standard authorities, but go on persevering and devising new methods, new rules, &c., for facilitating the work, because it is one of those arts which one may pursue for years and in which there will always be found something new, something to think on and make one feel that its possibilities are unlimited.



Mahogany Mantel in the "Osborne."—Scale, ½ Inch to the Foot.

Mantel Designs.

We lay before our readers herewith designs of some of the cheaper mantels employed in the "Osborne," a prominent apartment-house recently erected in this city. The designs were prepared by Mr. I. G. Perry, while the work was executed by Messrs. Brown & Bliss. Of both designs many duplicates were used in the building in question. One was executed in ash and the other in mahogany.



Ash Mantel in the "Osborne."—Scale, ½ Inch to the Foot.

The Relationship of Colors.

The relationship of colors is discussed as follows by William Brown in an article published in the London *Architect:*

Colors nearly related to each other (none of them exciting any one of the color sensations in a much higher degree than others) have always a good effect in juxtaposition. Thus, very dark colors, whatever their hue, are all congruous with black and with each other. Very light colors, again, whatever their hue, are all congruous with white and with each other. The colors which differ little in hue from the primary red, green or blue, or the secondary sea-green, pink or yellow, are congruous, respectively, with those colors and with each other, and the colors which differ little from the mean gray are congruous with it and with each other. The peculiar beauty of associations of kindred colors may be illustrated by compositions of dark red, dark green and dark blue upon a black ground, or by compositions of light sea-green, light pink and light yellow upon a white ground; or, again, by compositions in which a dark blue, a sea-green blue and a pink blue appear together, or in which a light yellow, a yellow red and a yellow green appear together. Associations of this kind are extremely common in nature. They are seen, for instance, in the various hues and shades of crimson or pink in roses, arising not only from the different colors of their parts, but from reflections and shades produced between the petals in the varieties of blue exhibited by the iris, convolvulus and larkspur, or of yellow by the daffodil and primrose. They appear in the folds of colored fabrics, in washes of pigments varying in thickness, in stones, in all sorts of polished woods, in the sky and clouds, around the setting sun, and in the charming gravish secondary hues which play on the surface of mother-of-pearl or on the feathers of doves. A certain degree of congruity is secured between all colors by the circumstance that it is impossible to excite any of the simple sensations of color in any high degree without a large mixture of the rest.

The plans prepared by Architect F. W. Hollister, of Saginaw, have been selected by the commission appointed to superintend the erection of the Michigan Soldiers' Home, at Grand Rapids, Mich. The building will be three stories high, with a basement, making an entire floor area of 80,000 square feet. It will be of brick, with stone foundations, cut-stone trimmings, slate roof and galvanized-iron cornices, and will cost about $100,000.

NOVELTIES.

Nason's Foot-Rail Brackets and Corner Fittings.

The Nason Mfg. Co., 71 Beekman street, New York, are offering to the trade a Foot-Rail Bracket, shown in the accompanying

Novelties —Fig. 1.—Foot-Rail Bracket.

illustrations. It has been their aim in designing this bracket to produce an artistic article, and one adapted by its form to bear the heaviest strain with the least possible

Fig. 2.—End Finish for Pipe.

chance of disarrangement, while at the same time it is very light. In describing the bracket the manufacturers refer to the difficulty of fastening a foot rail, and show that with the Griffin bracket the support comes from the floor, and is directly under

Fig. 3.—Corner Fitting.

the line of the heaviest strain, whereas, as ordinarily arranged, the foot-rest itself acts as a lever to loosen its own support. It is mentioned in the circular that when rails with the old form of bracket are in place

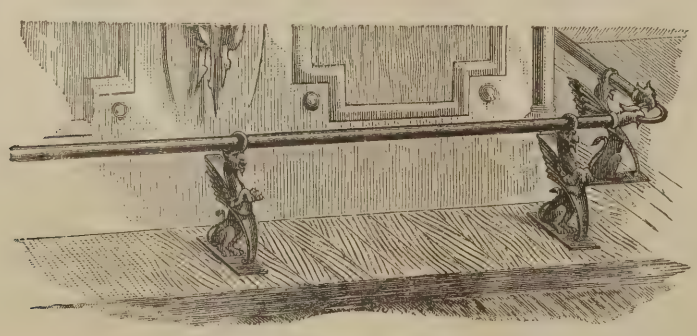


Fig. 4.—Bracket Set Up with Rail.

and in use the latter can be removed and substituted with the Griffin pattern without discarding the rail. These goods are manufactured in plain or galvanized iron, bronze and brass.

The Crosby Patent Sash Holder.

The Crosby Patent Sash Holder and Spring Weather Strip, a view of which is shown in Fig. 5, is manufactured and sold by Crosby & Co., 480 Broadway, Albany, N. Y. This holder, the principle of which will be easily perceived, allows the sash to run freely up and down, and when closed holds it firmly against the parting strips, preventing rattle and keeping out the cold and dust. Small brass springs are placed upon the outer sides of the upper sash, and an adjustable pin is screwed to the side of casing. In closing the window the spring passes under the pin, which presses the sash in against the parting strips and forces the check-rails together. In most windows this is said to secure a perfectly fitting sash and at the same time allow them to run freely. In large windows, if the lower sash is still loose, owing to a narrow check-rail, the springs should be also put upon the inner side of the lower sash. By following this plan, it is said, the loosest sash will be held tight and all rattling prevented. The holder can be applied with very little trouble, as may be seen by reference to the illustration. The spring and screws are brass and the pin nickel-plated. The holders are adapted to all windows, and are especially recommended for securing car, boat and omnibus windows. They may be applied over an old or worn weather strip, or in conjunction with any weather strip or lock. Referring to their durability, the manufacturers say they will last for years without getting out of place, and any desired amount of pressure can be given at any time by simply starting the screw and moving the pin nearer the spring. In a circular issued by the manufacturers they refer to some of the older methods of securing window sashes and preventing the entrance of dust, such as weather strips and locks, and point out the advantages of this article.

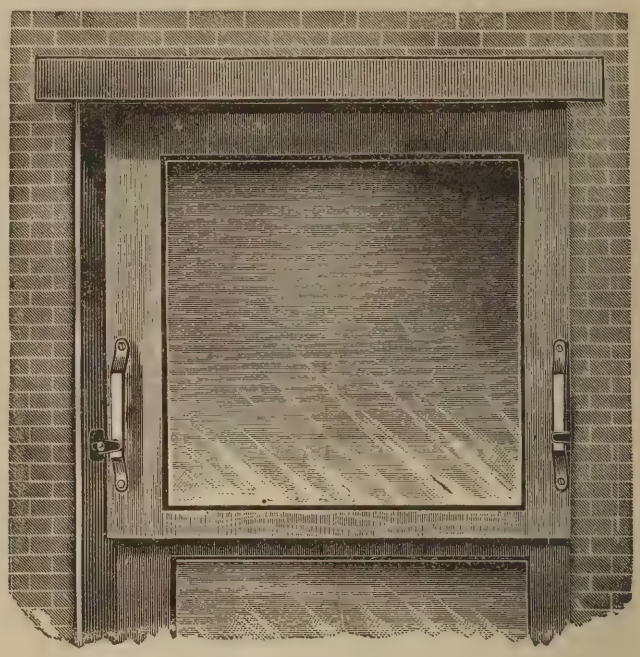


Fig. 5.—The Crosby Patent Sash-Holder.

Fig. 6.—Leavitt's Improved Screw-Driver.

Leavitt's Improved Screw-Driver.

Fig. 6 shows the manner in which the Screw-Driver named above, manufactured by the New England Specialty Company, North Easton, Mass., is constructed. It is intended to obviate the frequent trouble with screw-drivers on account of the handles working loose and coming off. To prevent this the tang which enters the handle is made flat and barbed or notched, as indicated in the cut. The manufacturers call attention to this device as rendering it impossible to pull the handle off without tearing away portions of the wood, while it costs no more to manufacture than the ordinary style. These screw-drivers are made in sizes from 1½ to 12 inches.

Gravity Blind-Catch.

A new Gravity Blind-Catch, the general features of which are illustrated in Fig. 7, is being put upon the market by the Kohn Gravity Blind Catch Co., of No. 216 Market

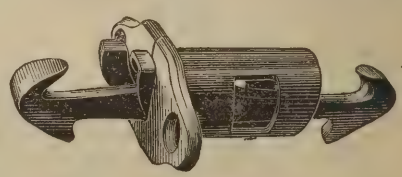


Fig. 7.—New Gravity Blind-Catch.

street, Newark, N. J. This catch is claimed to supply a long-felt want, inasmuch as it combines simplicity with neatness and does away with the use of springs. Durability is secured, and annoyances caused by breakage are obviated. The hooks work on a pivot in the center, which results in positive motion, and reduces the liability of getting out of order to a minimum. The catch would be

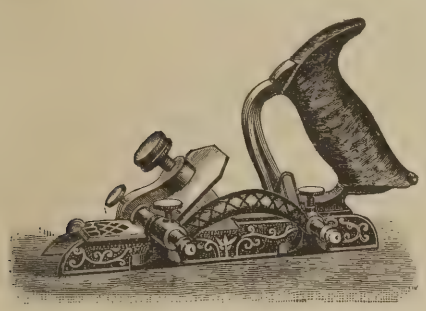
Fig. 8.—Special Lever Attachment Used with the Gravity Blind-Catch.

inserted in the lower rail of a blind, as clearly indicated in the engraving. In this position a hook is provided for catching the blind while fastening at the outside, and it is also furnished with a fastening on the sill of the frame. The blind is released from the outside fastening by touching the end of the outside

hook, which projects inside sufficient for the purpose. The two hooks are in no way connected, so that by no possibility can the blind be opened from the outside. The hooks are of malleable iron, and in all respects the fixture is of sufficient strength to insure long wear. A special lever attachment screwed to the face of the lower rail is illustrated in Fig. 8. This, when in place, serves to detach the outside hook by pressure applied to the end nearest the hinge, thus saving the necessity of reaching out of the window and across the blind. The catches are finished in two styles, in rubber and also in a preparation of vegetable oil, rendering them rustless.

New Chamfer and Angle Molding Plane.

Fig. 9 of the illustrations represents Lee's Patent Stop Chamfer and Angle Molding Plane, now being introduced by the Griffon



Novelties.—Fig. 9.—Lee's Chamfer and Angle Molding Plane.

Tool Co., 42 Point street, Providence, R. I., while Figs. 10 to 13 inclusive show samples of work done by this tool. The instrument represented suggests a most ingenious and successful combination of carpenters' planes. The tool, as shown in Fig. 9, is a stop chamfer plane ready for use, and will chamfer from ¼ inch up to 1½ inches in width. The work produced is shown in

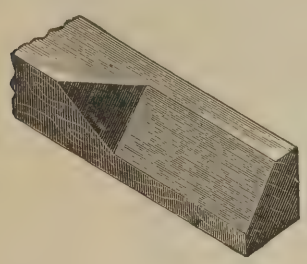


Fig. 10.—Plain Chamfer.

Fig. 10. By changing the width of the plane, being set by means of graduations which appear on the upper end of the sole in front of the bit, the plane is fitted for different widths of chamfers. By removing the plane-sole, and substituting soles of various special shapes, and also substituting bits corresponding to the soles, such work as is shown in Figs. 11 to 13 is produced. Of each of

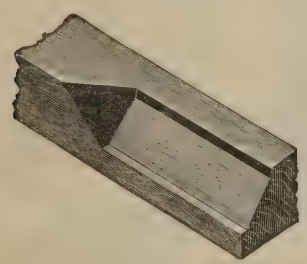


Fig. 11.—Sunk Chamfer.

these, namely, the cove, quarter-round and sunk chamfer, 11 sizes of bits are supplied, thus making the plane capable of producing all such work in the range of sizes ordinarily required. The tool consists of very simple parts, is thoroughly made and is effective in use. Two styles are manufactured, one with malleable-iron parts and the other with the parts of gun-metal. Inasmuch as it is frequently required as a chamfer-plane alone, the bits and soles for the other forms

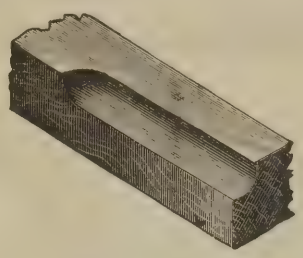


Fig. 12.—Cove.

of chamfer are sold as extras, and may be obtained as the individual purchaser may require.

Combined Band and Circular Saw.

Fig. 14 of the accompanying engravings represents a combined Band-Saw and Circular Rip-Saw, to be operated by hand-power, which has recently been introduced by W.

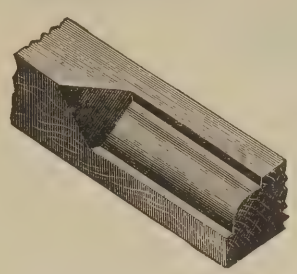


Fig. 13.—Quarter-Round.

Furness & Co., of Liverpool, England. This tool is described by one of the English architectural papers as being one of the most useful wood-working machines that has been recently introduced. It differs in several important particulars from American tools also in very sharp bending while the saw is in use, is carried around a third wheel, so that with the small tool the band-saw blade is still nearly, if not quite, as long as would be employed upon a large power machine, while the angles of the bend to which it is subjected in working are not such as would destroy its integrity. There is less novelty, however, about the circular saw and the arrangement of the bench. This part of the machine has a rising and falling spindle, thus adapting it for use with saws of different diameters, and is said, in addition, to be adapted for tongueing and grooving, rabbeting, beading and chamfering. From the latter description it is evident that other attachments than the saw are used. The fence, which is adjustable in all directions, can be turned over the bench, so as to be out of the way when cross-cutting is required. The bracket carrying the band-saw arrangement is bolted to the top of the bench, and in such a position as to be out of the way of timber when ripping or cross-cutting. Provision is made for attaching fast and loose pulleys to the fly-wheel, so as to apply power when so desired.

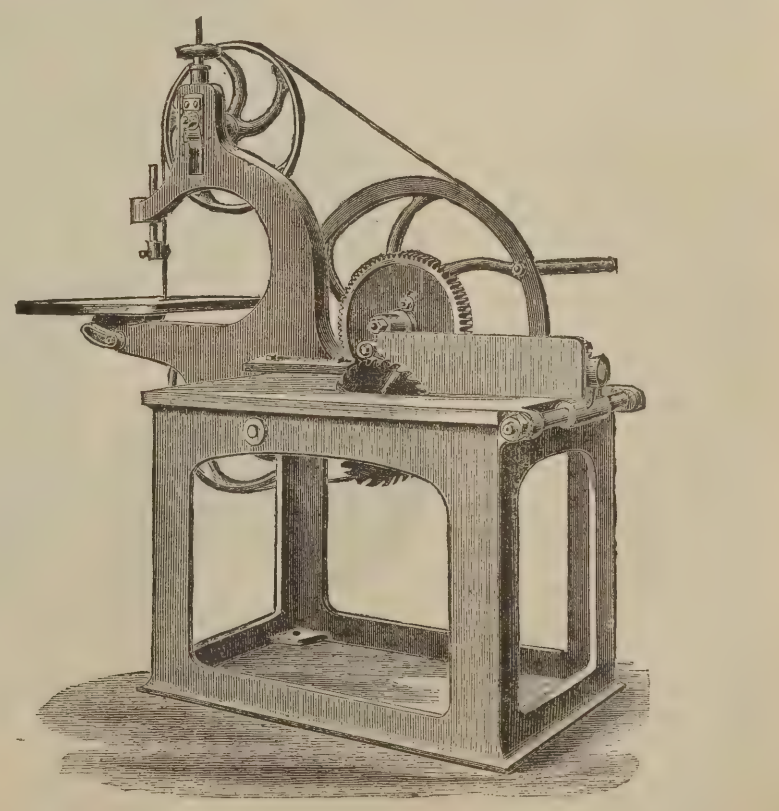


Fig. 14.—Combined Band and Circular Saw.

of the individual types here combined in one machine. The band-saw, it will be noticed, instead of being run around two small pulleys, resulting not only in a short saw, but

Excelsior Cutting Nippers.

C. E. Jennings & Co., 69 Reade street and 87 Chambers street, New York, are putting on the market, as sole agents, the Ex-

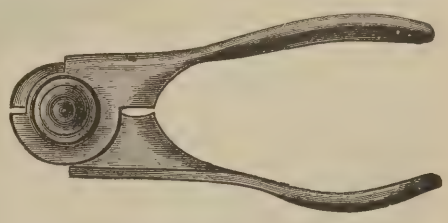
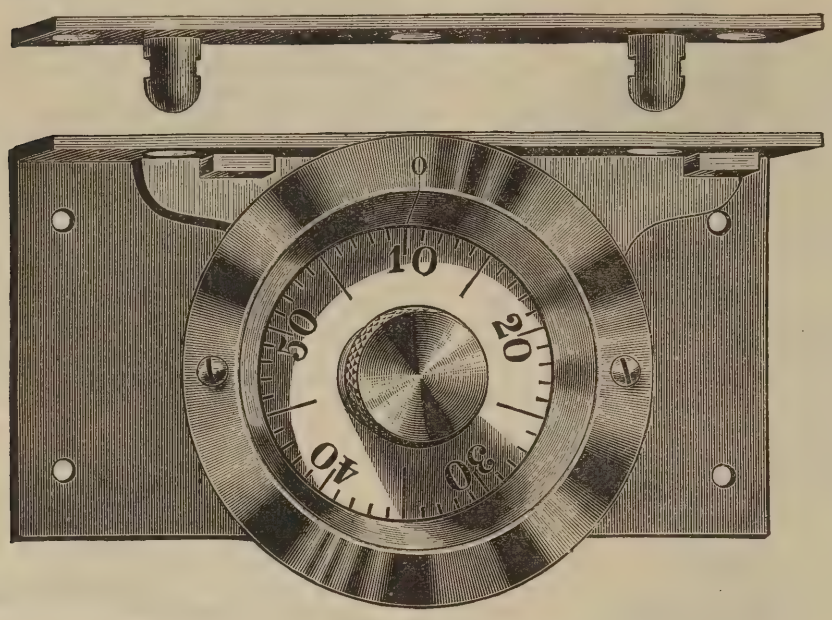


Fig. 15.—Excelsior Cutting Nippers.

celsior Cutting Nippers, the construction and appearance of which are illustrated in the accompanying cut. It is designated as No. 10, is 3 inches long and warranted to cut soft iron or brass wire up to and including No. 14. It is sold with the warranty that if it breaks within three months from date of purchase a new one will be given. This convenient and ingenious tool is offered at a low price, and is expected to meet a want of the trade.

Improvement in Combination Chest Locks.

The Miller Lock Co., Phiadelphia, Pa., have recently made an Improvement in their Chest Locks, which is represented in Fig. 16,



Novelties.—Fig. 16.—Flush Dial Combination Chest Lock.

showing that the knob is made flush with the woodwork of the chest, and is thus protected from injury when in use or in transit. This flush dial will also be available for the locks adapted to drawers, closets and desks as well as to those for chests. The manufacturers will continue to make beveled dials as before. The flush dials, as the others, are nickel-plated.

New Variety Saw.

The Egan Co., Nos. 221 to 241 West Front street, Cincinnati, are directing attention to a new Variety Sawing Machine which they have recently completed, an illustration of which is presented in Fig. 17 of the engravings. The company claim for this saw a nearer approach to perfection and the general wants of the trade than any other machine introduced. The machine is all iron and steel, and is so constructed that it can be handled with precision and accuracy, and at the same time convenience of adjustment and strength and durability of parts are in no wise sacrificed. They offer it as a standard machine for ripping, cross-cutting, beveling, gripping, grooving, mitering, &c. The machine may be described as self-contained, the frame being a cored pedestal supporting the table, and bearing a bracket cast on one side for the counter-shaft. The table is of cast iron, ribbed and braced. It can be set plumb, at right angles with the saw, or adjusted to any bevel up to 45°. The table is raised and lowered in planed jibbed ways, provided with an adjustment for wear. The fences are so constructed as to be used on either side of the saw, giving the operator every advantage and convenience, especially when using the table on a bevel. This is a feature that will be

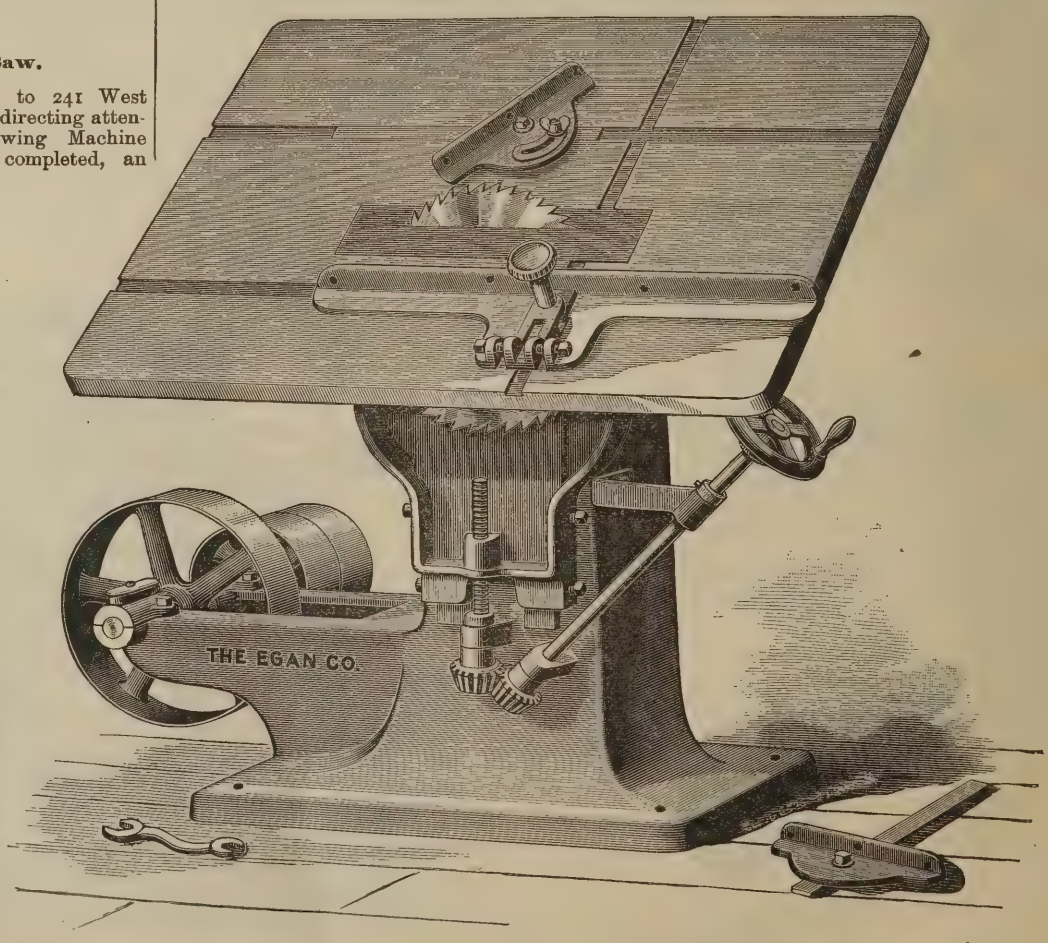


Fig. 17.—New Variety Saw, Built by the Egan Co., Cincinnati, Ohio.

A Chat About Planes.

One of the English cabinet-making journals presents an article in which some very interesting remarks are made concerning that most useful carpenter's tool, the plane. While written from other than an American standpoint, and dealing with the special forms of this tool best known to English mechanics, it is still readable:

Some of the various changes which the general introduction of machinery into our cabinet workshops has effected are most interesting to note. One of the more immediate results, apart from all consideration of the acceleration thereby imparted to the actual progress of the work, is the diminished amount of use of almost every tool which our trade requires for the construction of the most ordinary pieces of furniture. It is not our intention at the present moment to enter into the question of how much of the work might be or actually is done by mechanical means, or else we might profitably spend a short time in considering the most economical methods of breaking down the raw material, from the earliest stage through the numerous processes to the final one which leaves the work often far more than half completed. But the point which we wish to particularly emphasize just now is the immense quantity of work executed by machinery compared with that done through tedious use of the ordinary bench planes. What machinery will perfect in one operation is only accomplished by hand labor after the consecutive use of, it may be, jack, trying and smoothing planes, in addition to the various planes used in molding. Notwithstanding, however, the fact that the use of the planes we have mentioned is so diminished, they still play a very important part in the technical routine of our workshops, and may indeed claim to be the ones most used. But in shops where the planing has to be done by the old hand methods much may be observed which is hardly consistent with what one might be pardoned for expecting from an ordinarily intelligent artisan. For instance, no matter what may be the special circumstances bearing upon and affecting the strength and dimensions of the timber sent out for any particular job, it seems to be a recognized axiom that, unless all the three bench planes enumerated above are brought into play and passed over the surface of the wood, something will eventuate to spoil the whole work. Of course we do not mean to imply that that class of men to which we refer would exactly substantiate this reason-

ing, but the general fact nevertheless remains, and, as a natural result of such treatment, wood which in the first instance was barely strong enough to "finish" the required size, but which would have fulfilled the expectations of the cutter-out had it been carefully handled, is found to be perhaps, ⅛ inch or more too thin. In consequence of this inconsiderate treatment, either a point has to be stretched to admit of the wood being used up, and the plan of construction perhaps materially altered, or the wood has to be put back into the stock and fresh pieces cut out. That this is not a hypothetical case has been proved over and over again in the course of every man's exrerience, and it is the frequent source of much annoyance in every workshop. We need hardly say that, although in many cases it is found necessary to reduce the wood in thickness in order to straighten it, yet the primary object of the planing is to lay bare the surface of the wood, and, often enough, this is all that is necessary.

A lesson might be learned from the German craftsmen in the matter of planes. Besides their peculiar taste for conveniently shaped and handily contrived tools, which finds happy expression in a smoothing plane altogether different from our orthodox version, is their notion—perhaps not wholly their own—of having the irons of the rough smoothing and ordinary jack planes rounded over so much as to allow the middle portion to project an eighth or even more, while at the same time the outer corners are not allowed to leave projecting ridges on the surface of the wood operated upon. This contrivance is particularly useful where the wood has to be much reduced in thickness, say from 1 inch to ¾ inch, as is sometimes found to be the case. Then, by having the iron sharpened in the manner just described, the superflous wood may be taken off with a rapidity somewhat astonishing, the shavings being scooped off in groovelike masses, and when the plane is furnished in addition with a handle in front, and is rounded off at the other end to fit better the shape of the hand, some pleasure is found in executing what would otherwise be a very slow and tedious operation. We should add that the narrower the iron the better for this purpose, and 1¼ inches to 1½ inches will be found very suitable. Of course when the rough work has been done, the extra thickness having been "flogged" off, the surface has to be leveled and finished by means of the ordinary planes. While referring to these more unusual forms of tools, the question has occurred to us—as it has, often enough, before—as to the desirability or not of having a handle of some description affixed to the smoothing plane, much in the same way as is frequently done in iron smoothing planes. Any one who has had occasion to employ a plane of the usual sort for a couple of hours consecutively (and who among our practical readers could be classed outside this category?) can speak to the intense discomfort and often real pain experienced by reason of the sharp angular projection always found at both ends. If, then, a handle were introduced so that a firm grasp might be taken of the plane, the work could be performed quite as expeditiously and with much less discomfort and annoyance. We offer this suggestion to those of our readers who may feel inclined to spend a short time in the alteration of their planes, feeling assured that they would be amply repaid by the increased facility and pleasure found in their use.

Some amount of ingenuity has been expended by men in trying to evolve some method whereby the plane, after having been driven along the surface of the wood, might be carried back to a position in readiness for the next stroke by a mechanical contrivance which would allow the iron to escape the usual fate of being dragged along the dusty and sometimes sandy face of the wood, while yet not interfering with the proper action of the tool. Now we think that such extreme fastidiousness is hardly justifiable. The only invention we can call to mind as being at all successful, in its theory even, is one which is condemned by the ill-effects produced by the action of the invented mechanism upon the wood operated on, and which is for this reason put out of the range of practical cabinet-making In our estimation "the game is not worth the candle." Every apprentice, in learning his trade, is taught to carry the plane back from the end of the one stroke to the beginning of the other by tilting it upon one edge, and in thus making that the bearing point, leaving the iron quite clear of the wood. Of course the amount which the plane is tilted might be very small, and to a non-practical observer would appear quite imperceptible, but is enough for the purpose, and it does not make the work of planing more tedious or laborious. Our opinion is that the time spent in trying to perfect such an arrangement should be regarded as simply time and ingenuity thrown away.

A mistake which many of our younger workmen may commit is done in imitating, it may be, the example of some brother workmen in having a small turned or shaped knob inserted in the plane just where the hammer strikes it, for the purpose of driving out the iron or of adjusting it a little. They see what the object is in having such an arrangement, and, being desirous of emulating such a good example, they proceed to heat their planes in a similar manner. Now, the mistake made lies in the fact that they will most probably insert the block at the point where they think it should be, judging, perhaps, from the fact of it being more hammered there than at any other point. But to be really effective the block must be put in exactly the correct position, which can easily be found by testing the neighborhood of the supposed point by the hammer, when it will readily be seen that, whereas one smart tap in the place required will loosen and dislodge the wedge which holds in the iron, two or three are found necessary if the corect spot be not fixed upon. This, of course, is a small matter, but it is one which many an apprentice would be likely to overlook.

NEW PUBLICATIONS.

PRINCIPLES OF ECONOMY IN THE DESIGN OF METALLIC BRIDGES. By Charles B. Bender. Size 6 x 9½ inches, 195 pages. Published by John Wiley & Sons. Price, $2.50.

The system of competitive design combined with competitive prices has produced in this country the most economical and the most serviceable form of single-span bridges. But there are other forms, such as arches, cantilever trusses and arches and stiffened-wire suspension bridges, of which the merits and proper proportions are less generally known, and outside of the United States the question as to the most economical form of truss is not yet everywhere settled. Mr. Bender, in his preface, remarks that in the present book the error often fallen into of treating the web system and the chords of single-span bridges separately or independently has been avoided, and by multiplying the strain of each member of a fully-loaded bridge of a fixed number of panels with the length of the member, and then adding the product, formulæ were obtained which agree with American practice. While examining in this way the more important forms of trusses, &c., it was considered well to add some historical notes as regards the origin of those forms or types The results of the book could not be arrived at without entering into mathematics, which for the greater part is of an elementary nature. Only in some places somewhat higher analysis was found to be unavoidable. A number of plates furnish the necessary illustrations.

BAD DRAINS AND HOW TO TEST THEM. By R. Harris Reeves. Size 5 x 7½ inches, 68 pages, bound in cloth, illustrated. Published by E. & F. Spon. Price $1.40.

This work, published by an English author, is the result in some measure of the impetus given to improvements in sanitary matters by the conference held a year since during the Health Exhibition. It has also been suggested by the desire shown by engineers to improve the sanitary condition of towns. The work explains a system of detecting defects in drainage and sanitary fittings. The work is comprised in three general chapters, namely: "Bad Drains and How to Test Them," "Sewer Ventilation" and "The Origin and Transmission of Zymotic Diseases." In the first chapter, which bears the general title of the book, many examples of defective drains are mentioned, and methods for testing not only the drains themselves, but also the soil-pipe and various parts of the plumbing system in the building, are described. A pressure-gauge is employed in some instances, and in other cases burned sulphur or a pungent essence of some kind is used for locating the defect. Sewer ventilation is very carefully discussed, as is also the origin and transmission of zymotic diseases. The work is one to be of value not only to plumbers and practical men generally, but also to architects, engineers and house-owners.

USEFUL INFORMATION FOR ARCHITECTS, ENGINEER AND WORKERS IN WROUGHT IRON. Phœnix Iron Company, 10 Walnut Street, Philadelphia.

The Phœnix Iron Company, whose agents in this city are Messrs. Milliken & Smith, have issued a revised edition of their handbook. They show first the different shapes they roll, including I-beams, deck beams, channels, column sections, ties, angles and brackets. We note two new beams, to which we have already alluded, and five new channels. A price current follows, giving the extras on rounds, squares, flats, the weights and sizes of shapes, the lengths of Phœnix columns rolled with extras, a list of die-forged eyes on flat bars, and of upset screw ends on round bars. Then follows a brief chapter on some of the details of construction employed in wrought-iron work and the adaptations of the various shapes to structural uses. Thus, there are tables giving the elements of Phœnix beams, the comparative strength and stiffness of the different sections of wrought-iron beams made by the Phœnix Iron Company, and their adaptation and duty as flooring joists. Different designs of fire-proof construction with iron and hollow brick are illustrated, with a description and an illustration of Wight's method of fire-proofing and preparing for smooth-finish Phœnix wrought-iron columns. The details of construction showing the use of Phœnix columns with wrought iron and with cast-iron connections are added. Then follows a chapter on iron trusses with details, a record of tests of columns and beams, and a final chapter giving tables of weights and measures and miscellaneous data. The book is small and handy and is neatly bound.

One of the strongest claims made in behalf of Queen Anne domestic architecture, which has come to mean anything that throws aside all the rules of symmetry, is that it gives more variety and character to city houses than was possessed by houses of the old style, that stood along the streets like regiments of drilled soldiers. Speaking upon this point a Pittsburgh exchange asserts that it may be questioned whether a hundred houses of the same type, but with a few variations of an extra gable or an overhanging porch, show more individuality than the uniformity of the mansards of a few years ago or of the Gothic cottages of the last generation. In fact, the most thoroughly characteristic houses that exist in this country to-day are those of the early part of the century. There may not have been much æsthetic character in the solid, prim, Grecian mansions, of which we still have one or two noted types in our suburbs, but it was a solid and enduring character. Between the rank of some of these old mansions and some of the last vagaries of the architectural craze there is just about the same difference as between the strong individuality of Adams, Webster and the men of that generation and those of the present day who spend their days in *dilletante* studies of art or the worshipping of blue china. There are some specimens of the Neo-Renaissance architecture produced in the present era of construction that will always preserve their quaint beauty, but it will not be many years before the spawn of cheap monstrosities that now goes under the name of Queen Anne will be seen to be as inartistic a conventionalism as any of its predecessors.

CORRESPONDENCE.

Measurement of Tapering Timber.

From G. J., *Trenton, N. J.*—In the September number of *Carpentry and Building* several correspondents presented solutions of the problem of measuring tapering timber in answer to the question originally proposed by "J. W. J." of Watertown, N. Y. I am disposed to offer still another method, and one which to my mind is better than any of those heretofore presented. The accompanying diagram, which is to a scale of ½ inch to the foot, represents the timber divided into inch boards. When divided in this manner the pieces assume the form of trapezoids, the area of which is equal to one-half the sum of the parallel sides multiplied by the altitude. By the conditions of the problem, the stick diminishes 2 inches in every 2 feet. The figures 18, 16, 14, 12, &c., in the diagram represent the thickness at intervals of 2 feet. The six long boards in the center of the stick contain 72 feet. The next longest board measures 8 inches at one end, 18 inches at the other, and is 10 feet long. The contents of the two boards and these dimensions are 21 feet 8 inches. The tapering pieces I measure in the same way. It takes, however, two, one on each side, to make one. The result of my measurement in this manner is that I lack $\frac{4}{12}$ foot, or 48 square inches, of the 156 feet which the others obtained. However, I think that "J. H. M." or "P. W. W." could give me that much and still have enough left. The following is the detail of the calculations above referred to:

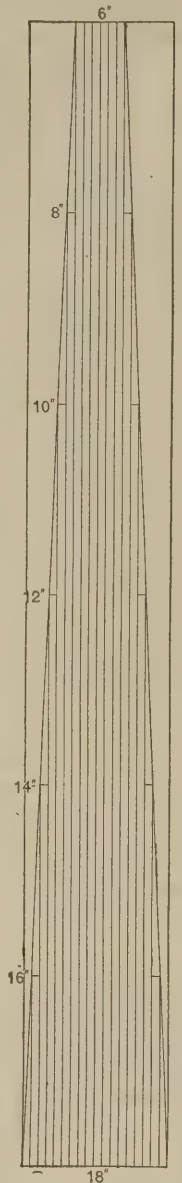


Diagram Accompanying Letter from G. J.

	ft.	in.
$6 \times 12 =$	72	00
$\frac{8+18}{2} \times 10 = \frac{130}{12} \times 2$	21	08
$\frac{10+18}{2} \times 8 = \frac{112}{12} \times 2 =$	18	08
$\frac{12+18}{2} \times 6 = \frac{90}{12} \times 2 =$	15	00
$\frac{14+18}{2} \times 4 = \frac{64}{12} \times 2 =$	10	08
$\frac{16+18}{2} \times 2 = \frac{34}{12} \times 2 =$	5	08
Tapering pieces:		
$\frac{6+8}{2} \times 2 = \frac{14}{12} =$ area of 2 pieces =	1	02
$\frac{8+10}{2} \times 2 = \frac{18}{12} =$	1	06
$\frac{10+12}{2} \times 2 = \frac{22}{12} =$	1	10
$\frac{12+14}{2} \times 2 = \frac{26}{12} =$	2	02
$\frac{14+16}{2} \times 2 = \frac{30}{12} =$	2	06
$\frac{16+18}{2} \times 2 = \frac{34}{12} =$	2	10
Total.....	155	08

From this it will be seen that 155 $\frac{8}{12}$ feet, or 155 feet 96 square inches, are all that I can get out of the timber.

Note.—Our correspondent has undertaken the problem in what would be perhaps characterized as a practical way in contradistinction to the scientific or mathematical method which was explained by some of the correspondents whose letters have been published in the past. Perhaps some of our readers who have the leisure will be interested in investigating this correspondent's method and in pointing out where he loses the 48 square inches which he mentions.

Addresses of Correspondents.

We frequently have letters from readers of *Carpentry and Building* asking for the full name and address of one or another of our numerous correspondents. To these requests our invariable reply is that, by our rules, we cannot furnish addresses. If those who desire to be put in communication with our correspondents have anything that is likely to be of interest to a considerable class of our readers, we shall be glad to publish it in our columns for the benefit of all. These remarks are partly in reply to a letter recently received from "J. D. R.," of Syracuse, N. Y., and in part to others who have also applied for addresses, as mentioned. Our Correspondence Department is being conducted in the interest of our readers at large, and not in the interest of individuals.

Hanging Doors.

From C. W. L., *Wilmington, Ohio.*—In answer to "F. A. K.," of Westerly, R. I., I would say that I always put on hinges by gauging from the inside edge of the door. On doors 1½ inches thick I gauge from the edge about ¼ inch. I cut away the wood, insert the hinge and put in the screws. I then use a compass in the rebate on the jamb, set $\frac{5}{16}$ inch apart at the points. Any variation in the thickness of the door on which the hinges are put will not show when the door is hung.

Design for Drug Store.

From J. M., *Santa Maria, Cal.*—In the June number a correspondent asked for drawings for a drug store. I was building one at the time, and had looked through every number since the commencement of the paper, in order to get some points, but to my regret I found no assistance. I was surprised that so important a part of our designs had been neglected so long; accordingly, I resolved to send you a description of the fittings, which I have just completed in the building referred to. I have been too busy to make drawings, and, accordingly, have had a tintype taken of the rear end of the store, from which you can gain an idea of the work.

Note.—Our correspondent's tintype is of a character to make it impossible to produce an engraving from it. It is lacking in detail, and the light on the parts represented is so poor as to leave us in doubt in reference to many features. Accordingly, we are unable to present to our readers what otherwise would be an interesting study. There is less of novelty and more of the commonplace in this design than we could wish for; in short, there is in it an eloquent appeal to the architectural readers of this journal for some other appropriate plans and details of work applicable to such cases. Our correspondent, thrown upon his own resources, and in a part of the country where architectural talent does not greatly abound, has worked out very creditable fittings, but there is a lack of grace and harmony about them which it would not be pleasant to see. The question, as our correspondent intimates, is one of interest to builders, and we trust that this renewal of the suggestion may call forth still further communications.

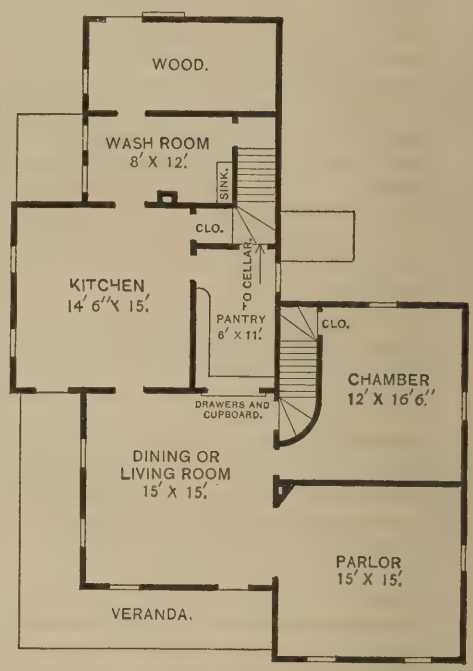
Cupola Designs.

From X.—In some of the early issues of *Carpentry and Building* there were published drawings of cupolas. I have lost some of my numbers containing them. Now I am in need of them. The plan of one of them was by a Worcester architect. Please inform me of the number referred to.

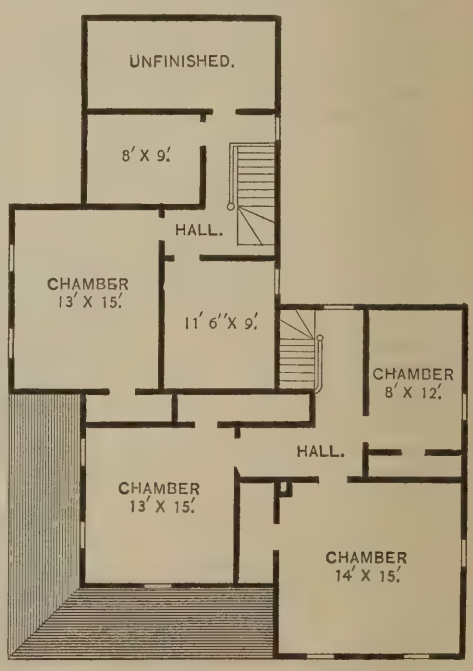
Answer.—Cupola designs were published in our volumes for 1879, 1880 and 1881. The particular design to which we think this correspondent refers appeared in our issue for September, 1880.

Farmhouse Plans.

From F. H., *East Troy, Wis.*—I have been much interested in the farmhouse plans published in *Carpentry and Building*. I inclose the first and second floor plans of a farmhouse upon which I am engaged at present. It will be noticed that one room is to be used as both living-room and dining-room, and that it is centrally located. There is a connection between it and pantry by means of a slide or by cupboard doors. Back of the kitchen is a washroom, and back of this in turn is the woodhouse. The upper portion of the house is divided into two general parts, front and rear, each having its own stairway. This arrangement seems to be necessary in well-regulated houses, wherever located. The woodhouse and washroom will have posts 14 feet long, while the remainder of the house will have posts 16 feet long.



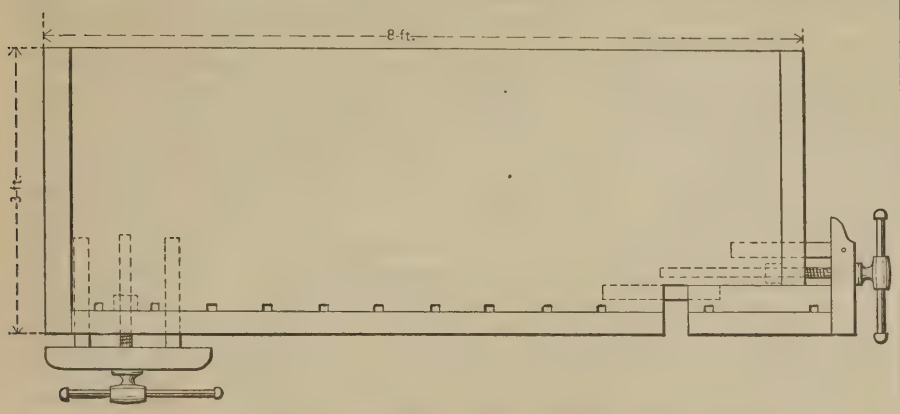
First Floor of Farmhouse as Designed by F. H.



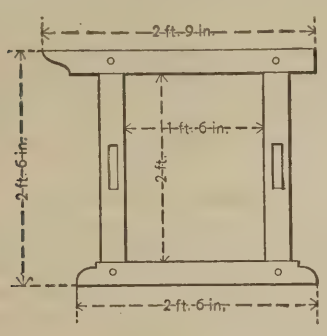
Second Floor. — Scale, $\frac{1}{16}$ Inch to the Foot.

Cabinet-Maker's Bench.

From A. M. L, *Fairview, Pa.*—I inclose an answer to the question offered by "C. R.," of Omaha, with reference to a bench. Referring to the accompanying drawings, which are made to scale, the lumber used in the bench should be of some hardwood—maple is to be preferred—and it should be thoroughly seasoned. The top is made of 3 x 6 inch stuff, dovetailed together with the exception of the piece on the front, which is set up edgewise and fastened by screws, The jaws of the vises are 3 x 6 inches, with the sliding arms 1½ x 1½ inches, framed in 3 inches below the top, which allows them to slide through mortises in the edge of the bench and be closed under the top of the bench. The framework is 3 x 3 inches, with the exception of the rails, which are 3 x 6 inches. The tenons on the rails should be 1½ x 6 inches, which will leave the posts ¾ inch thick on each side of the mortise, and also allow the mortise to be cut through to receive the key, which is ¾ inch thick. The mortise for the key should be 1½ inches wide on top and 1 inch wide on the bottom, the key being made to the same taper. The sockets for the bench dogs should slant ½ inch in 3. The body of the dog is 1¼ inches,



Top View of Cabinet-Maker's Bench Described by A. M. L.



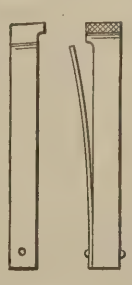
End View of Frame.

with a spring ¼ inch thick riveted on one side. This makes the body when finished 1¼ inches square. The head is 1¼ x 1½ inches, with a face slightly cut, like the face of a lath hatchet. The dogs are 10 inches long and the springs are of a character to hold them at any hight desired. Ten sockets are provided in the body of the bench and two in the tailpiece. The sockets in the body of the bench slant toward the tailpiece, while those in the tailpiece slant in the opposite direction. The bench when finished is 8 feet long, 3 feet wide and 2 feet 9 inches high.

Flexible Molds.

From F. A. P., *Salt Lake City, Utah.*—Can you give me a receipt for making flexible molds suitable for cast plaster-of-pairis center-pieces? I think there are some improvements in use different from anything with which I am acquainted, probably among the Italian plaster-workers. If you can furnish me any information in this direction you will confer a favor to one residing in a locality where there are limited opportunities for obtaining information on such subjects.

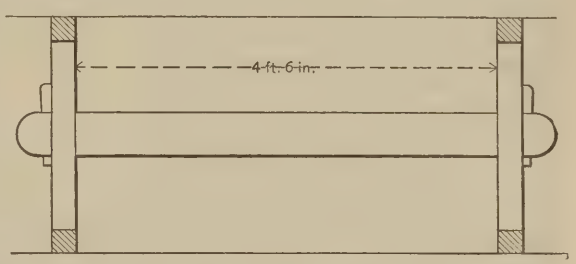
Answer.—We presume that there are methods in this line of business in use with which we are not acquainted, and which have never been published in any of the books of recipes. The following directions are given in the first volume of Spon's "Workshops Receipts." In certain conditions the elasticity of gelatine and gutta-percha allows of removing molds made of them from undercut or highly-wrought parts, and they reacquire the shape and position they had before the removal. This property is found in gelatine to a higher degree than in gutta-percha, but it requires a very rapid deposit, otherwise it will swell and be partly dissolved by too long an immersion in the solution of sulphate of copper. Put a sufficient quantity of colorless plates of gelatine in cold water and let it swell there for about 24 hours; then drain off the water and heat the gelatine upon a water bath until it has become of a syrupy consistency. It is then ready to be poured upon the object, which must be incased in a box of pasteboard or of thin lead. After cooling for about 12 hours separate the cast from the object. To enable the gelatine to remain longer in the bath without alteration, use one of the following mixtures: 1. Dissolve the best gelatine in hot water and add one-fiftieth of the weight of gelatine in tannic acid and the same quantity of rock candy; then mix the whole thoroughly and pour upon the model in its box. After a few hours the gelatine may be easily separated from the object. 2. A mold having been made with gelatine alone, pour on it a solution of water holding 10 per cent. of bichromate of potash, and after draining expose the mold to the action of the sun. 3. Beat, in 2 pints of distilled water, the whites of three eggs; filter and cover the entire surface of the gelatine mold with this liquid. After drying, operate with the solution of bichromate of potash, as in No. 2. 4. Pour some varnish upon the gelatine mold, drain carefully and let it dry. The best varnish for the purpose is a solution of india-rubber in benzole or in bisulphide of carbon. The mold must be metallized, and, when in the bath, submitted to a galvanic current of great intensity at the beginning. When the entire surface is covered with the copper deposit, and swelling is no longer to be feared, the intensity may be reduced. The following directions from an article on casting in plaster of-paris, by Mark Mallett, in an English periodical, are of interest: "Various substances have been used for making such molds, but that most approved by the best molders is gelatine. Having first made a single cast by the waste-molding process, take best sheet gelatine, 1 pound; beeswax, ½ ounce; water, ¾ pint. Boil them in a glue-pot till they form a thick syrup; rub a little oil (or, what is better, hog's-lard) over your cast, and then pour on the mixture. It should be used warm, but not boiling. The best and purest gelatine should be used. Some use glue or cheap gelatine, but these cannot be recommended. When the mold comes to be filled, the plaster grows warm in setting, and the heat thus generated is apt to melt an inferior mold."



Bench Dog.

A Bit of History.

From W. W., *Pittsburgh, Pa.*—In the August number of *Carpentry and Building*, in the article on "Cast Iron in Buildings," mention is made of a mill at Manchester, in England, that was built in 1801, by Boulton & Watt, for Phillips & Lee. In the year 1820 and for several years thereabouts I was employed in that mill, and at that time it was considered to be a fire-proof building. It was about 150 feet long and 40 feet wide, and built without any wood in any part of it. The floor-beams were of iron, supported on iron columns, having brick arches from beam to beam, on which were laid stone flags for the floors. The building was four stories high. The roof was formed on the hip-and-valley plan, all of the rafters made of iron and covered with either slates or tiles, I cannot now recollect which. All of the window frames and sash were made of iron, also the doors and frames, the doors hung on pivots, one working in the floor and another in the head of the frame, causing the door to swing in the middle, so that people could pass in on one side and out at the other side. The outside walls were substantially built of brickwork. This mill was the first one ever lighted with coal gas by James Murdock, the inventor of coal gas, who was then connected with the firm of Boulton & Watt. In this mill we had also elevators worked by steam-power, which carried heavy loads of goods and people from one story to other stories, could be stopped at any level, and worked as easily and as well as any elevator we have now in use about this city.



Side View of Frame.

Joiner's Wood Brace.

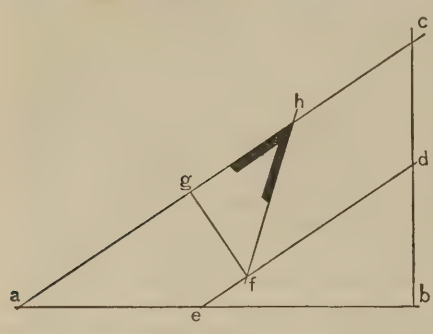
From A. S., *Green Bay, Wis.*—I desire to inquire if there is a tool manufactured in this country that may be described as a joiner's wood brace. I refer to such an article as could be found in every joiner's chest 25 years ago. I would ask, further, if that neat and artistic article, made of English beach or ebony, with its well-fitting complement of tools, has been driven out by the clumsy, brutal, machinist's brace seen in the hands of almost every wood-worker of the present day. Has the art of making wooden braces, as well as the art of using them, been lost? If they are not made in this country, can you inform me of a firm that imports and sells them?

Answer.—Careful inquiry in the trade indicates that wooden braces of the kind to which our correspondent refers are no longer made or sold in this market. We do not learn of anybody importing them, and we are informed that the iron or steel brace is gradually superseding the wooden article on the other side as well as on this side of the ocean. We do not think the majority of our readers will agree with this correspondent that the modern tool is brutal or clumsy as compared with the old wooden brace. In fact, we think the majority of them will agree with us in holding to the opposite opinion. A modern joiner's brace, made of iron and steel, with a good clutch and either with or without ratchet attachment, is a far more useful and convenient

tool than any wooden brace we ever saw. It is on the principle of the survival of the fittest that the modern tool has superseded the old one.

Rake Mitering with Horizontal.

From J. E. C., *Stanwood, Iowa.*—I inclose you a sketch showing how to get the rake cut to miter with a horizontal. The method illustrated I have not seen in any work: Draw the line A B and erect B C perpendicular to it. Draw A C to the required pitch. Draw D E parallel to A C. Draw F G at



Rake Mitering with Horizontal, Submitted by J. E. C.

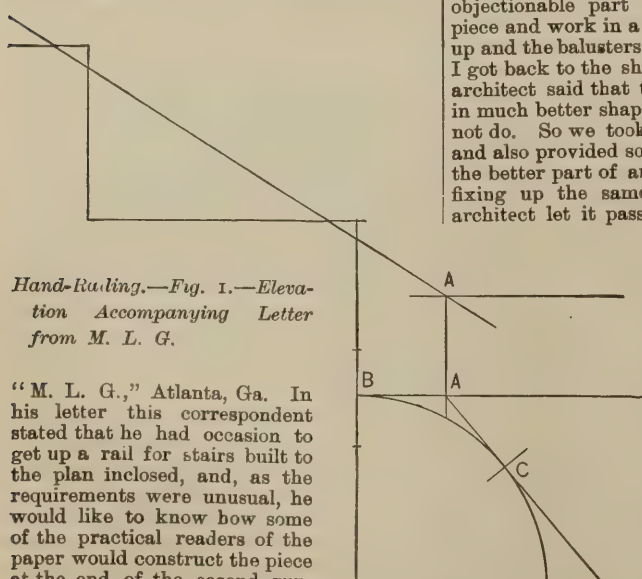
right angles to A C and E D. Make G H equal to C D. Draw F H, as shown. Then the resulting bevel as shown at H will be correct for cutting the rake to a square miter.

Raising Buildings.

From S. L. M., *Newton, Kan.*—I would say to "J. C. B.," Hickory Corners, Mich., that the best way to raise the building which he describes is to get about eight false studding to the side; 2 x 4's will answer. Place one end against the plate of the building on the inside, and the other about 2 feet from the wall on the floor. Spike fast and nail cleats from them to the posts of the building. Put 6 x 8 pieces underneath the floor against the joists on each side the length of the building. About a foot back put about four jacks to the side, under the 6 x 8. Jack up the building about 4 inches more than is needed. Put in the wall, then the sill, and then let the building down and spike fast.

Hand-Railing.

[In the number of *Carpentry and Building* for December, 1884, we presented a diagram representing a plan of stairs contributed by



Hand-Railing.—Fig. 1.—Elevation Accompanying Letter from M. L. G.

"M. L. G.," Atlanta, Ga. In his letter this correspondent stated that he had occasion to get up a rail for stairs built to the plan inclosed, and, as the requirements were unusual, he would like to know how some of the practical readers of the paper would construct the piece at the end of the second run. He stated, further, that he had done the work, but, inasmuch as he had never seen anything like it before, he submitted the question as stated. In our comments we expressed the regret that he had not answered his own question, so as to contribute of his knowledge to the general fund of information while making a draft for his own benefit. In response to this suggestion he sent us a letter, which we have not sooner published because we hoped still others in addition to those who have written on this subject in the interval would take up the question and present some ideas. We now lay our correspondent's second letter before our readers, and we feel certain that they will find it interesting. To understand it in all particulars it will be necessary to refer to the illustration in the December number, above mentioned.]

From M. L. G., *Atlanta, Ga.*—The way the work in question was done at the time referred to was by extending the raking tangent until it struck the line of level tangent on the platform, which would be at the point A, Fig. 1 of the accompanying sketches. I then made A C equal to A B, making the joint at C. This is similar to what "A. L.," of Fairfield, Iowa, said he would do if he wanted to be very scientific. I did not present the question to the readers of *Carpentry and Building* as being extremely difficult, and the work that I referred had been performed months before it was mentioned in the paper. Ten years ago I obtained all the experience I wanted with spring tangents or "butt bevels," as we called them. I was then working in Massachusetts, and my boss was a smart one. In his opinion, he could get out any required pattern with three lines. The butt bevel in the case referred to was put in a rail that went over winders in a quarter-circle. He intended to put the risers in a position to make the ramp on the first piece of wreath, but his head was scarcely long enough

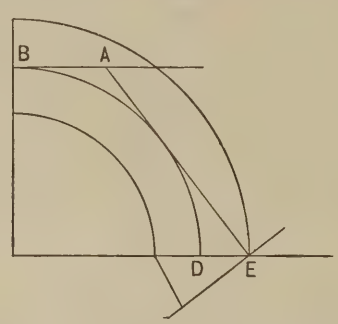


Fig. 2.—Shape Suggested by M. L. G.

for this, so the next thing was a butt bevel, which, when put in place, was decidedly objected to by the architect in charge, and with good reason. Something had to be done, so it was decided that I should take a piece of plank 14 inches long to the scene of the trouble, which was 25 miles away by rail. I was to saw out the objectionable part and fit in the 14-inch piece and work in a new easing with the rail up and the balusters in. This was done, and I got back to the shop the same night. The architect said that this effort left the work in much better shape, but that still it would not do. So we took a piece 20 inches long, and also provided some longer balusters, and the better part of another day was spent in fixing up the same work. This time the architect let it pass, but the owner of the house began to have an eye for easings. He thought it still too short, and was inclined to have still another change, but finally let it stand. As it was, I came near discovering a new system of hand-railing, one that could be used without employing any lines. I did think of getting out a book, and if I had gone once more to the job in question, taking with me a plank to reach all the way around the quarter-circle, I certainly should have been in position to do so. I do not often use butt bevels. I had an idea that the piece represented in the December number could have been made in one piece, like Fig. 2 of the sketches submitted herewith, working on the tangent A E, and cutting the joint at D afterward. I had hoped that some one would bring out this idea in answer to my question.

Artificial Stone.

From J. R., *Trenton, Ont.*—I am in want of some general information with reference to making artificial stone. I would like to learn the best method of producing a good and substantial article, and also to be informed where to obtain suitable designs for the work produced.

Answer.—The manufacture of artificial stone, to be successfully carried on, requires somewhat extensive plant, and, above all, a thorough knowledge of cements and other materials employed, which it would be difficult to convey in the space allotted to a newspaper article. The materials that may be used in the production of artificial stone are not necessarily alike in any two sections of the country, and therefore the exact process that would be successful in one place would not necessarily be equally satisfactory for employment in some other. Many efforts have been made to popularize artificial stone that have failed simply for lack of chemical knowledge, and because the industry was undertaken in the light of general information only. With this much warning before our correspondent, we will venture to give one or two recipes which have the sanction of more or less use. A cheap artificial stone is composed of 100 parts plaster-of paris, 10 parts hydraulic lime, 5 parts liquid glue and 500 parts of cold water, with sand as may be required. Mix well and pour into molds The pieces can be removed from the molds in a comparatively short time after pouring. The blocks should be exposed to the air for two weeks, or until they are dry. This stone is said to have a good ring and to be very cheap, particularly where materials are reasonable in cost. An excellent article of artificial stone is manufactured in some cases from slag; 2½ parts finely pulverized slag are added to 2½ parts of ground fire-brick and 1 of Portland cement. The mixture is run into molds and sets commonly, the articles being ready for use in five or six days. Material of this kind is molded into chimney-pieces, window heads and sills, wall coping and various kinds of ornamental work for builders, and is also used for paving walks, &c. With reference to the supply of designs or molds for such material, we do not know that there is any regular source from which these may be obtained. Any good carver or stucco-worker should be able to devise such patterns as are desirable for particular purposes.

Imitating Rosewood.

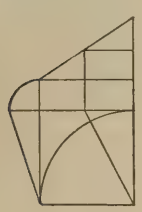
From W. E. H. & Son, *Little Falls, Minn.*—We would like to learn, through *Carpentry and Building*, how coffins and caskets are grained to imitate rosewood and walnut. We would like to know how many coats of paint are used, and what kind of graining color, and also, if possible, what kind of varnish. We propose entering in a small way upon this line of business, and would like to know how the goods are finished.

Answer.—If our correspondents are going into the business of manufacturing fine goods of this character upon any considerable scale they will require perhaps more information than we are likely to lay before them in a short paragraph, or else the experiments that will be necessary before they have succeeded in reaching a desired grade of work will be numerous. So far as we can serve them, however, we are glad to do so. The number of coats of paint depends in some measure upon the quality of the paint, the character of the wood and the method of its application. The end to be sought is a sufficient body and surface upon which the graining may be done. By frequently rubbing down, a finish will be reached which approximates that of the genuine article. Without this rubbing down the work would scarcely be so good. For rosewood graining the ground is rubbed in on a crimson vermilion, then smoothed and glazed with a coat of crimson lake or rose pink before putting in the grain. This is done with best ivory black, which can be bought ground in quick-drying vehicles, and needs letting down with raw linseed oil. The graining coat is blended with the badger

hair pencil as fast as it is laid on. When quite dry a very thin glazing coat of black is added. For walnut the ground color may consist of white lead, golden ocher, black and royal red, without fear of making it too bright. The graining color should be preceded by a coat of deep black and Vandyke brown ground in water, and before it has set this is stippled by dabbing with a dry thistle brush. On this is laid the walnut oil graining color procurable at the shops, previously thinned with turpentine and boiled oil. When the graining coat has partially set, the veins and figures are put in preferably with a fine hair pencil and softened with the blender. This last having dried, say, in a day or two, a glazing coat of deep black and Vandyke brown is put on and finished as in light oak.

Questions in Stairbuilding.

From S. B., *New Brunswick, N. J.*—I read with pleasure and profit the replies to my questions in the August issue of *Carpentry and Building*. You very fully comprehended my needs, and in the main satisfactorily answered me, clearing my mind on many doubtful points, for which I tender my sincere thanks. Had I known the large space that my letter and the reply to it would consume, or had I appreciated the labor necessary in preparing the answer, I hardly think I should have ventured to ask so many questions; but, having already encroached on your time, attention and space, and having been so fully answered, I am emboldened to ask your further indulgence, and therefore I propose a few more questions on points contained in your reply to my former letter. There are some matters which I do not fully understand. As an excuse for further troubling you I plead an earnest desire to fully understand the subject, and particularly to master the method of hand-railing which has been explained in *Carpentry and Building*.



Questions in Stairbuilding.—Fig. 1.—Diagram by Monckton's Method.

1. As I understand your answers 2 and 3, published on pages 156 and 157, the slide line will be any line drawn at right angles to the level or measuring line. Is this correct? Having the practical education referred to, I have no difficulty in properly shaping wreaths that are cut by patterns drawn by the method you explain. I have Riddel's work referred to, and I thoroughly understand the difference between face-molds drawn by his plan and those produced by the method described in *Carpentry and Building*. I prefer the latter plan, because less wood is consumed, and because they are very easy to draw.

2. Referring to answer 5, I think that your way of drawing elevations is correct and

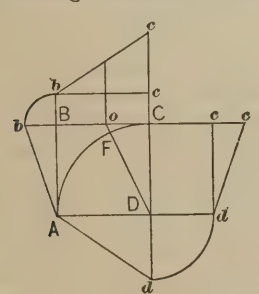


Fig. 2.—Diagram of Same Work by Method Referred to in August Number.

better than my way. The point that troubles me, however, is to determine what line or lines will be horizontal lines in the elevated plane. This is easy enough with a rake and level of a common pitch when it is known that the wreath is one of a common pitch. I have seen plans, however, that appeared to me as if the elevated tangents would be of a common pitch, but after drawing the elevation I found they were of different pitches. Now, how can this be decided from the plan and before the elevation is drawn? It seems to me to be necessary to do this, so as to find a level line by which to transfer the position of risers or balusters in order to obtain a correct elevation. Again, in the case of a plan where it is known that the tangents will be of different pitches, can the level line be drawn on the plan before the elevation is drawn, so that this line can be used to transfer points to the plan tangents by which to draw the elevation? This rather puzzles me, for it seems to be necessary, first, to find a level line, so as to draw a correct elevation, and also necessary to first draw the elevation by which to determine the level line. Perhaps I am very thickheaded; in any event, I think you can help me on this point.

3. While on the subject of level lines I will state that it seems to me that by Mr. Monckton's method a place in a wreath is found, when the rail assumes a level position, where the wreath may be made just the width of the rail, the rail not being parallel with the face of the plank. By your method the place fixed is not where the rail contained in the plank assumes a level position when the wreath is placed on the pitches, but a place where it is parallel to the face of the plank with its center at the center of the plank. You will perceive by this that I am much confused concerning this center point and level line, as shown in the system explained in *Carpentry and Building* and by Monckton.

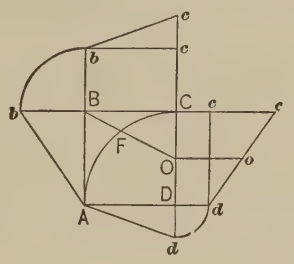


Fig. 3.—Diagram Drawn as Shown in Article XVI, with Steeper Pitch Below.

Will you please explain this more fully, showing the difference in the two methods and the advantages of each?

4. Could a point be fixed by your method and also another by Monckton's method and both be used on the same wreath at once to aid in shaping it?

5. Referring to answer No. 6 in my former communication, since I do not fully understand this subject of level lines, never having used them before, and being confused as to the several methods, I inclose a few diagrams from which I have omitted the elevated tangents, bevels, &c., which are points I think I understand fairly well. Fig 1 is drawn by Monckton's method, the steeper pitch being above. Fig. 2 is drawn the same as Fig. 9 in your replies to my former letter. These seem to be alike and to produce the same result. If this is so, in what way do the two methods differ? Fig. 3 is drawn as shown in Article XVI, on page 228, in the issue of December, 1881, the steeper pitch being below. Why is it that in this plan the level line is drawn from the corner of the tangents B to O, while in Fig. 2 it is drawn from the center of the wreath D to *o*?

6. In Fig. 4 the point *o* is found as in Fig. 2, and is transferred opposite to O. Then, O and B being connected in the same manner as in Fig. 3, the point is fixed at F. Now, I do not claim this to be correct, for I refer that to you, but I think that the flat and steeper pitches changing places would make more difference in the position of F in the circle than is shown in Figs. 2 and 3. I thought it would be very like that in Fig. 4.

7. Fig. 5 is a sketch that I did not intend to send you at all, but being so confused on this point I have concluded since making it to forward it also, thinking that perhaps it would assist in illustrating my desires and difficulties. The black lines (solid light lines) show the plan with the level line drawn the same as in Fig. 2, the center points being at F and *f*. The red lines (heavy lines) show this line and points produced the same as in Fig. 4. There is a great difference in these lines. With them before you I think you will be able to help me out of my trouble.

8. The answer to my eighth question as published is very satisfactory and leaves but little to be desired, the only point not fully understood being where you say: "In working, cut off the lower end plumb up from a level line drawn across the butt joint at the end of the tangents. On this face place the square pattern with the center 3 inches above the level line." This I do not fully comprehend and would like it to be further explained, yet I believe I could give this wreath a very good shape as it is.

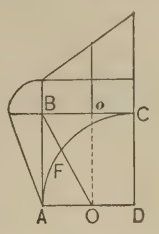


Fig. 4.—Still Another Method of Constructing the Diagram.

9. A short time since a friend of mine, also a stairbuilder, was called upon to place a rail on stairs that had been constructed by the carpenter who was engaged in building the house. My friend is not any better informed on the subject of hand-railing than he should be, and he was "stuck" by the problem presented. I did not see the stairs nor his plan at the time, or I should have tried to help him out of his trouble. After putting the rail up as well as he could he asked my opinion about it. In the conversation I told him that I had received much valuable information through *Carpentry and Building*, and I advised him to follow my course and refer the question to you. He promised to do as I advised, but upon second thought I concluded to write you myself, and therefore I will lay this question also before you at the present time. I have not yet had time to carefully study the problem, but shall do so in the interval while waiting for your reply. I inclose a plan of the stairs, Fig. 6, and elevation of the upper portion, Fig. 7, drawn as my friend had them drawn, except on a smaller scale. There was no difficulty with any part of the rail, except the piece that covered the quarter-circle at the top, connecting the rail over

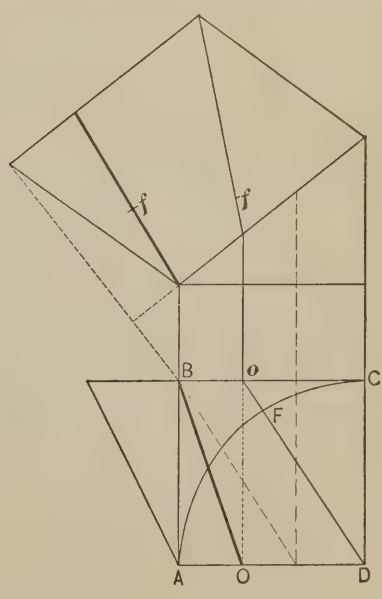
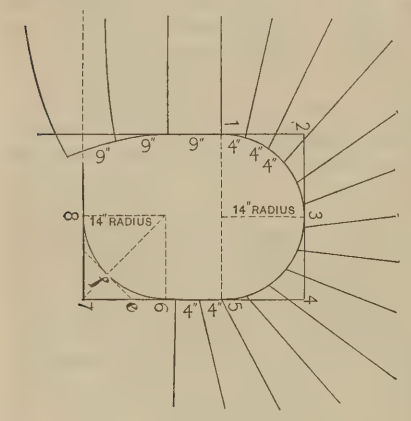


Fig. 5.—Sketch Submitted as Basis of Question No. 7.

the winders with the level rail. I do not think any difficulty would have been encountered here if the piece of straight rail, 5, 6, had been omitted and the winders carried into the quarter-circle, or if the top riser had been properly placed. Placing the top riser is something that is not well understood by carpenters, and very frequently, also, by those calling themselves stairbuilders. You will notice that the landing riser is placed about 1 inch out of the quarter-cir-

cle. This, in my opinion, gives all the trouble. My friend drew the pitch line A B and level line B C. He then drew a pattern for a rake and level wreath over the quarter-circle by these lines. You can easily guess the result. His level rail ran to a great hight, as shown by the dotted lines. He did not discover the error until he attempted to put the rail in place over the stairs; then, of course, he was compelled to throw this piece aside. He took a thick plank and cut out a plain level quarter-turn and worked an easement on it from *c* to *e*. This he put up, but it is not a satisfactory piece of work at all. The shape is poor and the appearance is not what it should be. I think the problem could be solved by drawing the lines *a b* and drawing a pattern for a rake and level wreath by the lines *a b* and *b c*, using a bevel joint at *a*. This would bring the



Questions in Stairbuilding.—Fig. 6.—Plan of Stairs Referred to in Question No. 9.

rail a little low at *d*. The questions that arise concerning this problem are as follows: Would the method last mentioned answer? Could the tangents in plan be changed so as to assist in solving the problem? What do you consider the best method of treating a case like this, or how would it be treated by the system published in *Carpentry and Building?*

I have again written a very long letter, much longer than I intended at the outset, but when once started I found it difficult to stop short of asking all the questions that were in my mind. The replies to my other letter will benefit me very much, and a reply to this will be of further assistance. I think your answer to the present letter will set me right, and that others will be benefited also by the publication of your reply.

Answer.—We appreciate our correspondent's embarrassment in sending us such long communications. We feel, however, that the subject is of sufficient importance to warrant the space consumed and the labor of preparing replies. In this as in the former instance we shall attempt to afford him the information he desires, but if we fail in any particular we trust he will follow up the subject still further and propose additional questions whenever it suits his convenience.

In our answer as published in the August number we remarked that the line for sliding the face-mold of a wreath-piece is always in the direction of the sharpest ascent on the elevated plane, or at right angles with any horizontal line drawn upon the face-mold, such as, for example, the measuring line, which is often used to fix a point in the center of the curve. We now have the question, Is this correct? We understand this to be equivalent to saying, If the statement referred to is correct, please to prove or illustrate it. In reply we give a popular, rather than a mathematical, demonstration, believing that it will be more readily understood. Suppose Fig. 8 to represent a cylindrical prism cut off at some degree of inclination, also having two more cuts parallel with the first and at equal distances apart, as shown. We have drawn upon this figure lines representing a rail-block, with the inner and outer edges finished according to the cylindrical form. On the top of this piece is a rail pattern having tangents of different pitches. Such a pattern as this (although it should have been taken from the center cut) has the correct form for use in sliding the mold. Now the slide line *l p* must lie in the direction of *x n*, which is parallel with the major axis of the ellipse *a b c d*. But the axis *a b* lies in the direction of the sharpest ascent upon the elevated plane, as it is evident that a line drawn in any other direction, as *a w*, would not answer this description; *l p* or *x n* is also at right angles with the minor axis *c d*, which is a level line. They therefore would be at right angles with any other level line which might be drawn across the face pattern. It may be here remarked that this pattern, if cut square through the plank, would not be wide enough at either end to get out such a rail-block as is here shown. It would be wide enough, however, for an ordinary twist, as the superfluous wood on the top would come off at *r* and *s*, also from the bottom at *m* and *v*, so that there would yet be room enough for the square pattern of the rail if set with the pitch bevel at both ends.

2. Our correspondent's next question may be paraphrased thus: How is a line to be drawn in the plan to be covered by a level line in the elevated plane without first knowing what the elevation of the tangents will be? Our reply is that by the method we have been explaining we are unable to do this, but we can decide on the elevation of the tangents before completing the elevation plan of the balusters. We will take the plan shown in Fig. 7 of the illustrations in the August number for an example. In Fig. 9, presented herewith, we have re-engraved the plan above referred to. We first have the ground plan of the stairs, showing the tangents, circle and riser lines. We also mark the points representing the short balusters. Now, it will be seen that the two short balusters on the circle lying nearest A and C are not far from their respective tangents A B and C B. We may therefore transfer these two balusters on to their tangents by lines drawn in the direction D B without fear of getting much out of the way. Let us now produce C B to L, and, bringing around the necessary points from A B on to

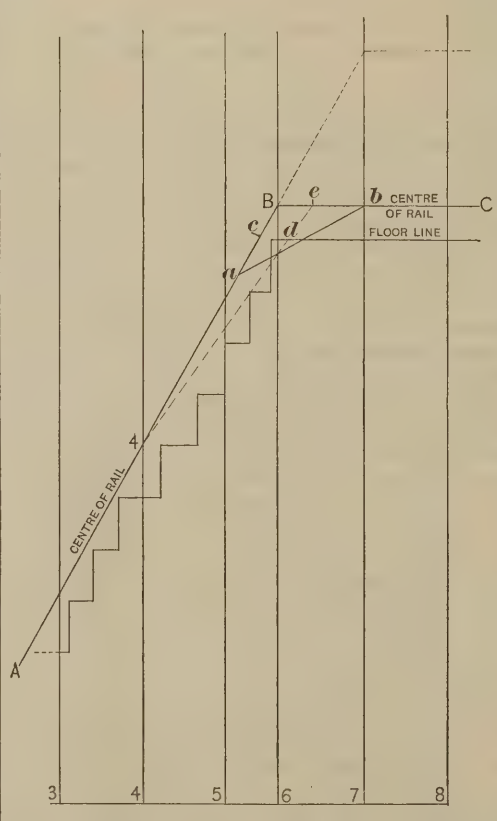


Fig. 7.—Elevation of Upper Portion of Stairs Shown in Plan in Fig. 6.

B L, form an elevation of balusters as shown, excepting the baluster *f*. Also, draw the center line of rail through the short balusters of the straight flights above and below the circle.

It is now evident that by using two pitches over the circle we may avoid having a ramp at the upper end of the wreath-piece. Let us, then, draw *b m*, making the distance *a m* enough to allow for an easy ramp below. From *a* draw the horizontal *a b*, and from *b*, at the meeting of the two pitches, draw the horizontal *b c*. Complete the parallelogram

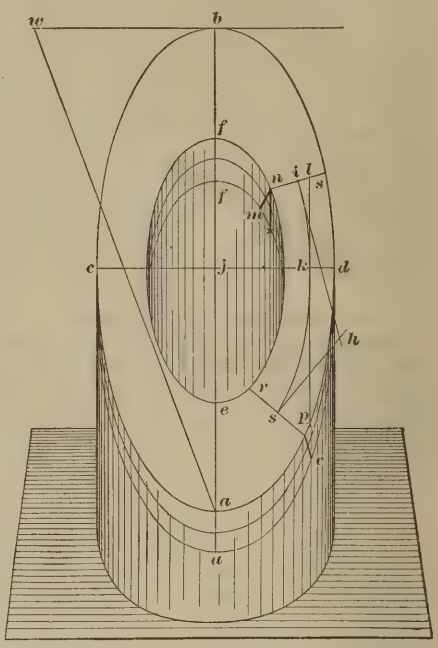


Fig. 8.—Diagram Embodying a Popular Demonstration of the Slide Line.

A D C B. On the side D C draw the corresponding elevation D *d c c* C, making C *c* equal to *c c* on the baluster elevation, and the part *c c* equal to *b b*. Draw O *o* equal in hight to *b b*, and connect O B. Now, O B is a level line, both in the plan and in the elevated plane. Therefore we may complete the elevation of balusters, drawing the transfer lines parallel with O B.

3. We do not wonder that our correspondent is somewhat mixed on the statements concerning the rail assuming a level position and yet not being parallel with the face of the plank. The rail when cut out is supposed to be level across it at any point, but it is only parallel with the face of the plank at one point, and that is where the minor axis of the ellipse crosses the pattern. When the two pitches are alike the minor axis and the diagonal of the elevated plane are one, but when the pitches are different they do not coincide, but are two separate lines. Mr. Monckton in such a case gives measures on both of these lines, measuring from the center of the circle. In our series of articles the measuring line was generally drawn from the outside corner, where the tangents meet each other, the object being to lay out the rail pattern with as little width as possible on the substance from which the pattern was to be cut. Such a measuring line, except when it coincides with the minor axis, will not cross the pattern when the rail is parallel with the face of the plank, and yet, when the pattern is to be cut from a board of limited width, it will usually be found the most convenient way of working.

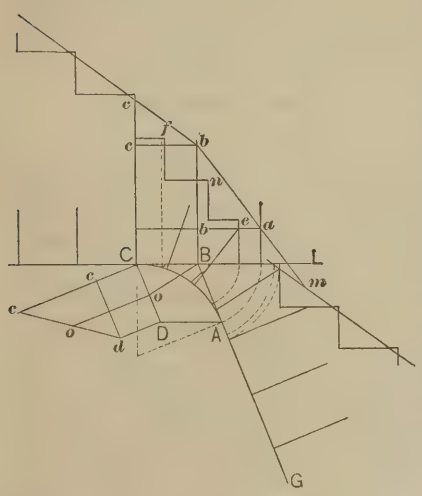
4. The rail pattern used in the square-cut method is essentially the same as to its center line as that produced by any other correct method. Our correspondent therefore may use the measuring line shown by our method on the lines produced by Mr. Monckton's method, or all of them together, as they will agree, and produce the same pattern.

5. As all the square-cut methods of drawing a pattern produce the same result when the rail is finished, we do not confine ourselves to any one way of working, but often vary it as circumstances seem to suggest. There is, however, a noticeable difference

between the method we have published and that employed by Mr. Monckton. It is this: By our method of drawing the face pattern the relation of the elevated tangents is fixed by a certain measurement of angles in connection with one of the plumb bevels, while by Mr. Monckton's method he first obtains the length of the diagonal of the elevated plane, and then from each extremity of this line draws intersecting arcs, using as radii the respective elevated tangents, thus forming the parallelogram of the elevated plane. The advantage we have by the other method consists chiefly in that we require less width on the pattern board.

6. In answer to our correspondent's sixth question we would say that either way of drawing, as in Figs. 2, 3 and 4, gives a measuring line which will be level in the elevation, so that from either end of the elevated line a measure to the center curve may be taken directly from the ground plan F is not a fixed point at all, but at Fig. 2 it is found on a measuring line drawn from the center of the circle, while at Fig. 3 it is found on a measuring line drawn from the outside corner. At Fig. 4 it is taken on a similar line drawn from corner. This is why Figs. 3 and 4 in this case differ more at the point F than Figs. 3 and 2.

7. In Fig. 5 our correspondent has made a mistake. The line B O if properly drawn would be parallel to *o* D. This we



Questions in Stairbuilding.—Fig. 9.—Diagram Illustrating Answer to the Second Question.

have shown by the light dotted lines in the engraving, which we have added to the diagram as he sent it.

8. By the end of the tangent we mean the point on the face of the lower butt joint where the tangent is supposed to come out through the stick. The level line referred to will be at right angles with the plumb bevel. After this second face is cut plumb up from the said level line, then make a new center for the rail 3 inches (more or less, as the case may be) higher up, to allow for the easement. Said easement is then cut by the eye, beginning square from the second face, as aforesaid.

9. Referring to our correspondent's statements about the difficulties encountered by a fellow-stairbuilder, we would remark that at the second effort the right thing in the case was attempted, but the effort was not carried quite far enough. The best thing to do in the first place would have been to make two pitches on the second wreath-piece of the first circle, the second pitch from 4 to *e* meeting the level tangent *e f* at *c*, as we have shown by the dotted lines on the ground plan and as indicated by the dotted line 4 *e* on the elevation. This would give a rake and level easement wreath at the top, passing from 6 to *f* and there connecting with a level curve. The straight rail between the two wreath-pieces should be supplied by adding straight wood to the top end of the lower wreath and to the bottom end of the top wreath, thus affording an opportunity to twist the straight part a little and make the whole thing look easy.

Building Association Problem.

From J. L., *Mankato, Minn.*—The answer to the building association problem in the September number of *Carpentry and Building* is a long way off. The rate of interest named, 2.3256 per cent., would require a monthly payment of $63.095. The rate of 1.8 per cent. would require a monthly payment of $59.98. I know of no rule to solve this problem. Somewhat similar problems, where the rate of interest is given and an equally regular payment is required, are solved by geometrical progression. Where any three of the five parts are given, the other two may be found. In this case only two parts are given, namely the number of terms, 20, and the sum of the terms, 1000.

Cisterns.

From S. L. M., *Newton, Kan.*—I notice by the January number of *Carpentry and Building* that "W. S. S." desires some advice concerning cistern construction. I have found the Black Diamond (Louisville) cement very satisfactory for cisterns as well as for brickwork in cisterns. I consider it best to use no mortar of any kind in the walls, but to lay them up dry to the arch. Then use lime and sand and give the arch a good coat of cement and sand on the outside, using two parts of sand and one of cement. Follow by a coat of the same on the inside. Two barrels of cement will plaster a 50-barrel cistern and will give a good job.

Tool-Chests.

From P. D. G., *Lebanon, Ohio.*—Will some reader of *Carpentry and Building* please give, through its columns, a design for a handy and convenient tool-chest for a carpenter? I have just completed my apprenticeship and am acquiring a set of tools. I desire a good chest for holding them.

Answer.—This correspondent's inquiry has been so thoroughly replied to in the past that it seems hardly necessary to devote attention to it, at least so soon after valuable and interesting communications on this subject have been published. We refer him to our June issue for this year, and also to the October number, and several designs which will be found in our volume for 1880. The back numbers of *Carpentry and Building* can always be supplied.

REFERRED TO OUR READERS.

Plaster for Exterior Finish.

From A. M. L., *Fairview, Pa.*—Referring to Mr. F. Bartlett's design, published in the number of *Carpentry and Building* for July, 1885, I would like to ask him how he would mix the plaster for the exterior finish of the house illustrated.

Design for Fences.

From I. T. T., *Walden, Mass.*—Will some practical reader of *Carpentry and Building* furnish me a design for an ornamental wooden fence? I have been looking over back numbers of the papers and can find almost everything else I want but a design different from the everlasting slatted fence. That is just what I want now, and therefore I ask for it. Thorough construction in combination with reasonable cost is desirable.

Hardwood Finish.

From G. S., *North Adams, Mass.*—We are having considerable discussion here about hardwood finish. I claim that a nicer finish could be made by finishing from the scraper without sand-papering. The carpenters think I am mistaken. I would like to hear the opinions of practical men among the readers of *Carpentry and Building.*

Bad Acoustics.

From M. B. P., *Lincoln, Ill.*—We have a church in this place that is very difficult to speak and hear in. Especially is the latter the case for those sitting near the middle of the house. It is not so difficut to hear when near the speaker or at the rear end of the room. To those in the center, however, there is such an echo or rumbling sound that hearing is very difficult. The building is 42 feet wide and the side walls are 25 feet 6 inches high. The ceiling pitches toward the center, rising nearly 12 feet in half the width of the building, the center hights being 37 feet. The room is 73 feet deep and the walls are smooth plastered, there being no wood brackets or cornices or other ornament. Will some reader of *Carpentry and Building* suggest a method to overcome the difficulty?

Glass Sash Pulleys.

From A. S., *Nashville, Tenn.*—A short time since I saw a pair of sashes hung with weights and cord, but in place of iron or brass pulleys in the frame the pulleys were provided with glass thimbles. The owner of the house tells me that the pulleys in question have been in use for over 15 years, and the cords are as good to-day as when first put in. Can you inform me where such goods can be purchased? If not, please refer my question to the readers of *Carpentry and Building.*

Roof Construction.

From J. M., *Woonsocket. R. I.*—I have some questions which I desire to present to the practical readers of *Carpentry and Building.* In adding an L to the main body of a house where the pitch is the same on both roofs, what is the best way to construct the gutter which forms the junction? Is it better to run a long sheet of tin the length of the gutter or valley and then shingle both sides of the tin, leaving a center water space, or is it better to shingle the gutters tight, leaving no water space? Are valleys better with or without tin running their entire length? The question that I desire to settle is how best to make a valley gutter in order to have one that will not leak. Incidentally the question arises, Is it safe to drive nails through tin on the roof or around windows in a roof where the tin is used simply to prevent leaks? How flat a roof would be safe against leakage if the best cedar shingles are used? Would one-fifth pitch be too flat under these conditions? Would one-sixth pitch be safe against leakage if the best shingles are used?

Water-Wheel.

From G. A. S., *Chemung, N. Y.*—Will some reader of *Carpentry and Building* kindly contribute plans and details of a water-wheel to be built of wood. I have abundance of material in stock and plenty of water with 3-foot head. The wheel is to be used for threshing, grinding feed and sawing wood. In this connection I would inquire, Which would be the most economical, a paddle-wheel or a wheel constructed of turbine shape?

Note.—Without forestalling any replies which may be made to this question by our practical readers, we would suggest that a cast-iron turbine water-wheel will probably be far more economical for our correspondent to use than any construction which he may get up himself. Turbine wheels are largely manufactured by different companies, and their use has been brought down to an exact science, and, besides, prices are very reasonable.

Saw-Filing Machine.

From E. H. R., *Houston, Tex.*—I desire to obtain the address of C. S. Stephens, the inventor of a machine for filing saws that was patented April 6, 1880. If any reader of *Carpentry and Building* can furnish this information he will confer a favor.

Bedrooms on the Ground Floor.

From C. D. J., *Norwalk, Va.*—I make an appeal to the designers of houses, in the interest of our wives and daughters, who in most cases are physically unable to climb stairs many times a day, and it is ordinarily necessary in order to gain access to the bedrooms in a house. Will not some of the architectural fraternity kindly furnish plans for a house containing four or five rooms, with abundant closet-room on the first floor and only one or two rooms in the upper

story? The house should be planned without limitations, so far as lot is concerned, and, to meet the requirements of many families, should be placed facing the west. The house I have in mind should cost from $1000 to $1500. I have looked in vain for something of this kind during the past two years, and think that my wants are not unlike those of other readers of *Carpentry and Building*.

Polishing.

From E. H. R., *Stephentown, N. Y.*—Will some practical reader of the paper give me directions for polishing oak and other woods finished in oils for picture frames and room finish.

Arrangement of Rooms.

From J. H. W., *Shelburne Falls, Mass.*—I am in business as a builder in a small way. I frequently come in contact with customers who want houses built with an arrangement of rooms somewhat like that given below. As I have never been able to bring it about in a satisfactory manner in all respects, I submit the problem to the readers of *Carpentry and Building*, who seem to be able to do almost anything that is required in the building line. The house plan that people about here are striving for is something like this: On the ground floor there must be a sitting-room, dining-room, kitchen, pantry, bedroom, bathroom, and storeroom for wood and the like, and a staircase hall. The sitting-room, dining-room, kitchen and bathroom must open from the hall. The sitting-room must connect with the bedroom and dining-room. The dinning-room must connect with the bedroom, kitchen and pantry. The bedroom must connect with bathroom. The kitchen must connect with pantry, storeroom, and also have doors opening outside and to cellar stairs. The bedroom must be provided with a closet, and the dining-room with a china-closet. The second floor is to have three large rooms and one servant's room, all opening from the hall and all provided with closets. Additional desirable features may be added at the option of the designer. No doubt many will perceive objections to the arrangement described, but since there seems to be a demand for just such plans in this locality I have undertaken to solve the problem. If some one among the many readers of *Carpentry and Building* can help me in this he will confer a favor.

Beehives.

From E. E. W., *New Hartford, Conn.*—I desire to inquire of the practical readers of *Carpentry and Building* the best method of putting beehives in an attic of a house, or arranging the attic so as to constitute it an apiary.

Irish Baronial Castles.

From G. S. P., *Brooklyn, N. Y.*—Will some of the historical readers of *Carpentry and Building* inform me in what work I can find a correct history, with the dates of the building and final destruction, of the ancient baronial or feudal castles of Ireland?

White Cement.

From S —Will some practical reader of *Carpentry and Building* give me directions for making the white cement used in making joints in stonework on buildings?

Damp Houses.

From J. M. M., *Chicago.*—A year ago I built a six-roomed cottage of brick, set on posts 6 feet high. The ceilings are 10 feet high, the roof flat. A double floor was laid with tarred paper between. All the outside walls are furred and all are plastered with two-coat work. The brick walls are 8 inches thick. The carpenter-work is well done and everything appears to be good and tight. The house proved to be a very comfortable one during the extreme cold weather of last winter, but the bedrooms and closets were very damp. Ice formed on the outside walls, and in the closets clothing would get so damp as to be unfit for use. Can some practical reader of *Carpentry and Building* inform me of the cause of the dampness under the circumstances above described, and also the best remedy to be undertaken?

Row-Boat.

From A. G., *Allanstown, Pa.*—Will some reader of *Carpentry and Building* submit the drawings and description of a round-bottom row-boat about 18 feet in length? At the same time I would like to learn the most desirable wood to be used for the purpose.

Siding Nail.

From H. L. W., *Arlington, Neb.*—I desire to inquire through *Carpentry and Building*, if there is a nail in the market made particularly for use with siding. The nail should be like an 8d. casing, with quite a large head, equal to the size of a 6d. common or longer.

Note.—We do not know of a special nail of this kind in the market, and are under the impression that the work our correspondent describes is an unusual one. If any of our readers have anything to communicate on this subject we should be glad to have letters from them.

Cuts by the Steel Square.

From F. P. W., *Columbus, Ohio.*—Will some scientific reader of *Carpentry and Building* explain why 6 and 12 on the square will not give the cut for an octagon when 12 and 12 give the cut for a miter?

Note.—This question, which may appear very simple to some of our readers, opens up the general theory of the use of the steel square in obtaining lines in carpenter work. It is one to which our correspondents can well afford to devote some attention, and answers to which, presented in our columns, will be of great interest to many of our readers, especially the young men in the trade. Therefore, instead of attempting an answer ourselves, we prefer to ask our readers for as many different forms of reply as may seem possible under the circumstances.

Hall and Staircase.

The following description of the decorations of a hall and staircase in a new country house is from a recent number of the *Painters' Magazine*. In the hall in question the writer says there is not the ordinary depressing effect occasioned by a ceiling with a hole in it. The hall is square, closed over by the second floor, the staircase being placed in a recess which is separated from the hall proper by upright and cross timbers, open to view and of solid character. The roof beyond over the staircase is prolonged downward, and made to show the sloping beams and rafters. The square hall has three doors opening into dining-room, sitting-room and study. One can at once realize the opportunities here offered for scenic color decoration, aided by bold lights and shadows, the more so that there is no dazzling glare of white light to interfere with the hues. Three stained glass windows of oblong shape and of soft but clear tints transmit the light from the front façade, the designs being mediæval. The surface of the frescoed walls has been covered with ordinary stucco, and then a thin layer of marble dust, of the colors required for the background, has been laid on like ordinary stucco luster and rubbed smooth. The ornaments and figures upon this are in the usual fresco colors, which have been rubbed in with a little soap, more intimately to unite the color with the substratum, and then gone over with a hot iron, thus reviving the ancient practice. The colors introduced are bluish violet, green, ultramarine, purple, orange and turquoise blue, displayed in panels separated by small pilasters having white shafts and gilded capitals. The frieze is in vermilion, green, bluish violet and white.

There is a warmth in the display of hues which imparts to the hall a cheery aspect. On the panels of the three doors are climbing plants in light green, with pink petals and white blossoms, the roots and stems being in the lower panel and the blossoming above. The pillared entrance to the staircase recess, including cross beams, is painted characteristically in Egyptian style—red, blue, green and yellow—the plain curved capitals showing Egyptian symbols painted in red on a blue ground. The colors on the surfaces of the hall present a radiant appearance in the subdued light, while a good proportion of the colors on walls and pillars are repeated in the carpet In the painting of the ceiling the interior band is placed far in, and the intervening space filled up with a wholly different pattern, by no means in light colors, but contrasting more effectively on this account with the remaining surface, on which spiders' webs are stenciled on a pale orange ground. There is a fine effect from the more sober tones given to the rafters, beams and railing of the staircase, the former golden brown, with interspaces of blue, the latter of mahogany, and the whole illumined by trefoil plates of ground glass let into the walls. The access to the staircase is by steps of good width and easy rise that project into the hall, thus more clearly indicating the position of the stairs. This hall in a country gentleman's house indicates what latitude can be allowed to coloring in the way of contrast, where it is used to emphasize various architectural divisions. Colors that do not well assort with each other when brought in contact may yet find their appropriate place in the scheme of decoration, a point illustrated in this hall and staircase, constituting types which might well be followed by architects and colorists.

Lime and Cement.

The following consideration of the general subject of lime, cement and their uses appears in the columns of one of our English contemporaries. Many of the particulars presented are of a character to be valuable among a large class of our readers:

It will be evident that, irrespective of the quality and strength of the stone or bricks to be used in the construction of a building, the mortar which unites them will exert considerable influence in the strength and permanency of the whole structure. Too much importance, therefore, cannot be attached to the selection of the materials, cement or lime and sand of which the mortar is composed, and to the manner in which the mortar is compounded and used. To enable a proper and judicious choice of materials being made it is essential that at all events a rudimentary knowledge should be possessed of the component parts of each, for it is impossible to make choice of a material of which nothing but its outward appearance is known. The very slight knowledge of weaving, for instance, possessed by the generality of people enables an opinion to be at once formed as to whether a piece of material is of properly woven thread, or is what is generally termed "shoddy;" so a slight knowledge of the components of a cement or lime and of their manufacture may assist in enabling a just opinion to be formed as to whether the sample under consideration is a good, honest material, capable of giving good results under proper treatment, or is worthless as a material for construction.

All cements used in building from the earliest ages have lime as a base combined with silica and alumina in varying proportions, or are what for practical purposes may be considered pure limes. The limes have been divided by Vicat into five classes, and, as the classiffcation satisfies the distinctive qualities of each in a very perfect manner, there seems no reason why it should be disturbed. He classifies them as follows: No. 1. The rich limes. No. 2. The poor limes. No. 3. The slightly hydraulic limes. No. 4. The hydraulic limes. No. 5. The eminently hydraulic limes. The eminently hydraulic, the hydraulic and the slightly hydraulic limes are those which set more or less freely in water. These are all produced by the simple calcination of limestone containing different proportions of lime, silica and alumina, in a state of chemical or only mechanical combination. Thus the rich limes, or what are often called fat limes, are produced from the simple calcination of limestone, which is

for practical purposes a pure carbonate of lime, such as a good white chalk. The poor lime is the result of calcining a limestone which contains a larger or smaller proportion of inert material—that is, silica in the form of sand or other materials, which are only combined mechanically with the base of carbonate of lime. Coming, then, to the hydraulic limes, they are produced from limestones which contain silica and alumina in varying proportions in actual chemical combination with the base, the slightly hydraulic having but a small percentage of silica and alumina, while the eminently hydraulic may have as much as 20 per cent. of the two. For instance, the slightly hydraulic lime would be produced by the calcination of the gray chalk, and the eminently hydraulic from the limestone in the blue lias formation. In addition to the above, there is the lime produced from the dolomites or magnesium limestones.

The process of manufacture or the burning of lime is simple. The limestone, reduced to pieces of convenient size, is placed in alternate layers with coal in kilns and burned. The chemical action resulting from the calcination is the expulsion of the carbonic acid from the limestone, resulting in the production of quicklime; this again has to be converted into a hydrate of lime by the addition of water when required for use. The proper methods of doing this will be described later on. Cement, or what is known as "Portland cement," has also, as has been already said, a base of lime, but contains a considerably larger percentage of silica and alumina in chemical combination with the base than any of the limes, and the calcination is carried out at a much higher temperature. The manufacture of cement is, further, not of such a simple character as that of lime. It is seldom that in nature a limestone is found that possesses the exact proportions of lime, silica and alumina for the production of Portland cement. The desired combination has therefore to be produced artificially by mixing materials which contain the required ingredients. This is generally attained by incorporating with a limestone a clay which contains the silica and alumina in proper proportions. Portland cement may be produced from any raw materials which contain the requisite proportion of each ingredient. Some, however, are, of course, more easily treated and manipulated than others, while for purely commercial reasons it would be impossible to use some of them.

Chalk and clay are the materials which lend themselves most readily to mapipulation. A description of the manner in which they are treated for the production of Portland cement will give a very general idea of some of the difficulties attending its manufacture, and enable just conclusions to be formed as to the causes of peculiarities which may be developed in any samples under consideration, or in any cement that may be used. The chemical properties of the chalk and clay which the manufacturer uses having been determined, they are mechanically mixed with the addition of water in a wash-mill; the resulting slip, or, as it is technically called, "slurry," passes through a sieve as it leaves the wash mill, and is then, according to the most advanced processes of manufacture, passed through millstones and ground. From the millstones it is either pumped or run by gravitation on to large floors (under which are arranged flues) and dried. When all the moisture has been expelled, it is loaded into the kilns in alternate layers with coke and burned. The resulting clinker, which should be dark in color and calcined almost to vitrefaction, is then broken into pieces the size of walnuts and ground in millstones to the desired fineness, the result being the Portland cement of commerce. Thus the difficulties of manufacture will be appreciated. An error in the mixture of the due proportion of the raw materials, or in their proper and perfect mechanical admixture, or an error in the calcination, will result in a more or less imperfect cement, which, when used, will give indifferent or absolutely bad results.

The limits within which the chemical analysis of a Portland cement may vary is but small, not more than about 5 per cent. in the quantity of lime, and even this small difference, though not of itself sufficient to render a cement unsound, will make a cement either slow or quick setting, according to whether it contains the maximum or the minimum quantity. The amount of calcination to which a cement has been subjected will also within certain limits render it slow or quick setting, according as it has been hard or light burned. Though theoretically a cement as it leaves the millstones is fit to use, practically it should be warehoused for some time, and allowed to cool before it is used. Theory and practice are often at variance without any assignable cause, but in this case the cause is easy to determine if the action which takes place by calcination is examined. Unlike the limestones, which by calcination are only deprived of their carbonic acid, the calcination of a raw cement effects in addition to the expulsion of the carbonic acid, the chemical combination of the lime, silica and alumina, which previously were only in a state of intimate mechanical admixture. If, therefore, this chemical combination has not been absolutely perfected, and except in a laboratory this is practically impossible, there will remain in the cement a small percentage (it may be only 1 or 2 per cent.) of lime, which, though deprived of its carbonic acid, has not entered into chemical combination with the silica and alumina, and which remains, therefore, in a state of quicklime; and the action of adding water to it in this condition would cause it to expand, which, it is needless to say, would be detrimental to any work in which it was used. The object gained, therefore, by allowing a cement to be warehoused for a considerable time is to allow these small particles of free lime to air-slack—that is, to abstract carbonic acid from the atmosphere, and become so many inert particles in the cement.

The presence of a small percentage of inert air-slacked lime is not detrimental to a cement; but of necessity the presence of free lime in any large quantity would render it, when fresh, very dangerous to use; and when aged the presence of this inert lime would become an adulterant, and proportionately reduce its strength. Given that the cement is properly proportioned and calcinated, the finer it is ground the better will be the result obtained with it in practice. There are, however, certain limits which it is not possible for the manufacturer to exceed economically, namely, it is more economical to use a large proportion of cement than pay the manufacturer the extra cost necessitated by finer grinding; the economical point is attained when a cement will, when sifted through a sieve having 50 holes to the lineal inch (2500 to the square inch) leave a residue on the sieve of only 10 per cent. This degree of fineness is sufficient for almost any purpose for which cement is used. A cement may be slow or quick setting, according to the purpose for which it is required. The quick-setting cements attain great strength in a short time, but afterward do not improve much, while the slower-setting, though longer in developing their strength, continue to improve for a long period, and ultimately attain greater strength than the quick-setting ones. A cement should carry at least 175 pounds per square inch when three days old, and should show an increase of at least 50 per cent. when seven days old, but the minimum strength at seven days should be 350 pounds. A slow-setting cement will generally increase more than this, but at the seven days the quick-setting cement will generally be stronger than a slow-setting one. A cement is quick-setting when it sets in less than an hour; a slow-setting cement will take five or more hours to attain the same hardness. Cements that take from one to five hours to set are comparatively more or less quick or slow setting. The time which a cement takes to set is determined by the time elapsing between the time of gauging it with water and until it will resist the pressure of the thumb-nail.

The quality of cement is determined by: 1. Its fineness. 2. The time it takes to set. 3. Its tensile strength at the expiration of three and seven days from gauging. 4. Its freedom from either expansion or contraction, or, in other words, its soundness. To carry out a cement test satisfactorily a considerable amount of skill, and, above all, of experience, is required. It is very easy, indeed, to obtain false results, more especially in testing the tensile strength; and, as a false result means a comparatively bad one, a test, unless carried out by an experienced person, may mean the condemnation of a really good material, resulting in disputes, reference to arbitrators, perhaps to legal proceedings, and at all events to much unpleasantness. The general instructions which follow for carrying out a cement test are given, therefore, not for the purpose of enabling the user to carry out his own tests—which, by the way, he could not do without the necessary plant—but to enable him to have sufficient knowledge to direct the manner in which a test should be carried out, and to enable him to draw up a specification which shall coincide with his requirements and the capabilities of a cement. It is worse than useless to draw up a specification which cannot be complied with.

On all important works the cement should be tested before being used, not after it has been put in the work. It is more satisfactory and fairer to the manufacturer to know that the cement he is supplying is approved of or rejected before the complication of claims for labor expended and for pulling down and loss of time can have arisen; and it is certainly equally satisfactory to the user to know that the cement he is going to use is of the desired quality, and that he is certain of obtaining good work if only the manipulation is carried out properly. The fineness, time of setting and soundness of a cement are absolute properties. The tensile strength is varying within certain limits, according to the skill of the operator in making the test blocks, but it must be understood that in testing the tensile strength the object is to obtain the very best results possible. The sample for testing should not be all taken from one sack, but from at least half a dozen, and well mixed before commencing the test. The fineness should be first ascertained by weighing out a certain quantity, say 25 ounces or 12½ ounces. It is best to reckon by ounces and to take either of these quantities, because, in the first instance, ¼ ounce, and in the latter case, ⅛ ounce, is equal to 1 per cent. Having weighed out the cement and placed in the seive of the proper mesh (50 by 50), it must be sifted through until nothing more will pass, when what is left in the seive must be weighed, and the percentage at once determined. This experiment should be carried out twice, with different portions of cement, in order to insure accuracy and to be certain that a fair sample of the cement has been taken, and if there is any serious discrepancy in the results a third experiment must be made.

A practical writer on the use and management of wood-working machinery gives the following directions for deadening the sound of circular saws: "The circular-saw frame should be fixed on a brick or stone bed, and the shaft or bearings kept clear of the wall, so that the sound is not carried by contact into the wall. If the wall is not built we recommend a hollow wall with iron ties and the space filled with sawdust, no opening of any kind being made. If the wall is built, and of single brick, line it with another single brick wall, inserting sawdust between, or a layer of hair felt. If the wall is of wood quartering, lath and plaster it on both sides and fill in between with sawdust, or coat over the studding with hair felt and lath and plaster over the face of it. In fixing the quartering, if attached to wood at the top or bottom, bed the attaching points or parts in hair felt. Sound will travel with air; therefore exclude all connection of air. Sound will travel through glass, wood or stone, except it be of great thickness; therefore intercept it by sawdust or hair felt, which are non-conductors. If you have a circular saw on one side of a wall and you want a point of silence on the other, you must stop all direct communication and cause the sound-laden air to travel in long and circuitous routes and give out its vibrations before it reaches that point."

TRADE NOTES.

THE NOVELTY MFG. CO., Nos. 10 to 20 Dickerson street, Syracuse, N. Y., send us a copy of their illustrated catalogue of fancy cabinet-work, stands, easels, foot-rests, blacking cases and other specialties. It is a large, oblong pamphlet of 24 pages, handsomely illustrated with woodcuts showing many novelties in each of the several classes of goods named. The standing book-shelves, cabinet book-cases, over-mantles, music cabinets and tables illustrated are exceptionally fine. The designs presented include many novelties that go to make living-rooms attractive.

THE STANDARD WOOD TURNING CO., of Jersey City, N. J., are inviting the trade to send for their illustrated catalogue of machine-turned balusters, newels and other goods. Their card will be found on another page of this issue.

THE UTICA STEAM GAUGE CO., No. 86 Fayette street, Utica, N. Y., have issued a very handsome descriptive circular of the steam heating apparatus manufactured and erected by them under the patents of E. A. and W. E. Wood. The first page of the cover contains a combination design bearing the legend, "Good Befall Hearth and Hall." In the lower portion is shown a typical old style fireplace, with andirons, and a tea-kettle hanging on a crane. It is steaming away, and in the clouds of vapor and smoke which arise are pictured, first, the basement of a dwelling, showing the location and appointments of a steam boiler and the pipes leading from it, and, secondly, a library and a sitting-room, which evidently are heated from the source last described. The three views of apparatus and apartments heated are unusually realistic, and exhibit a detail that warrants a close scrutiny and rewards the observer by what is shown. Examination reveals that in this respect the design is a composition, and that photographs have been combined with the sketch of the fireplace first described. The whole has been so well considered as to produce a pleasing effect and to render the cover of the pamphlet unusually attractive. We have occupied so much space in describthe outside that there is less opportunity to indicate what is contained within. Several phototypes are there displayed, a number of them representing houses in which apparatus of this company is used, one of them in particular showing the Mann Building, in Utica, which has three No. 4 boilers made by this company. This cut has been prepared from a photograph, and yet a portion of one of the walls is shown broken out, revealing the rising pipes and steam fixtures through each of six stories. The artist has been ingenious in his method, and is so successful as to convey the idea that the building was thus broken open at the time the photograph was taken. In addition the pamphlet contains illustrations of different forms of apparatus, with accounts of a system of window heating, also one of church heating, with a general treatise on healthful warming of buildings, and numerous testimonials. The pamphlet is a desirable one for examination by all who are considering the question of heating buildings.

THE SEXTRO FURNITURE CO., of Cincinnati, send us their fall catalogue with reduced price list of center tables and library tables, hat-racks and other goods. There is a very extensive display of designs in this volume, and sets of designs in which the individual pieces partake of one common character with minor variations, thus making it possible to secure an article of a given character at almost any figure that may be required. The assortment is usually large and interesting.

MESSRS. CHENEY & HEWLETT, with office No. 201 Broadway, New York, and works at Greenpoint, L. I., have issued a small pamphlet containing numerous tables relating to wrought-iron beams, girders, cast-iron columns and other features of iron construction, arranged in a form to be specially useful to architects and builders. This firm are manufacturers of every variety of wrought and cast ironwork for building purposes, and hold themselves ready to make estimates upon all kinds of work in this general line that may be demanded. We understand that this little pamphlet is to be followed by others of a similar character at regular intervals.

GUMMEY, SPERING, INGRAM & CO., of Philadelphia, are directing attention to the Patten metallic shingles which they manufacture, and also to different grades of terne plates which they supply. They have a plate with heavy coating called Pontymister Old Style, and another with equally good body, but lighter coating, called Alderly. These goods are described in their card on another page.

RAND, MCNALLY & CO., Chicago, have recently issued the edition of their directory and shipping guide of lumber mills and lumber dealers for 1885 and 1886. The former edition of this work was described in detail in our columns. It is sufficient to say, with reference to the present volume, that it is fully up to the high standard of excellence of the first, and that it contains a large fund of information that is of value to all in the lumber business.

THE PORTSMOUTH MACHINE CO., Portsmouth, N. H., send us a copy of their illustrated catalogue describing their system of steam heating. A general view of the works of the company is presented on one of the early pages in the book, following which is a chapter on steam heating, in which the requirements of a perfect steam warming apparatus are enumerated, and in which also the advantages of the system illustrated in the pages following are alluded to. Views of the water-tube boiler built by this company under Carman's patents are presented, together with upright boilers, horizontal tubular boilers and a number of designs of tubular radiators. At the close of the book several engravings of buildings are presented which are warmed by the apparatus manufactured by this company.

W. T. COMSTOCK announces the second part of "Architectural Studies," containing Plates 13 to 24, inclusive. The subjects treated in this volume relate to stores and business places generally, and the designs are by various prominent architects. Among the studies are a village store, a large retail store, a *café*, a restaurant, a corner drug store and a bank with office finish. The treatment relates principally to the elevations and outside details, although in some instances floor plans with suggestions of counters are included.

IN ANOTHER COLUMN in this issue Erskine W. Fisher, who has recently located at No. 78 Beekman street, New York, directs attention to the patent soapstone finish for walls and ceilings for which he has been agent for some time past. We described this material in our Novelty Department some months since. It is adapted for use plain and also in various colors. Mr. Fisher also supplies Potter's colored mortar and other materials in the same general line.

P. PRYIBIL, corner Tenth avenue and Fortieth street, has issued Part 2 of his catalogue relating to machinery for working brass, ivory, horn, &c. Among the tools shown are buffers, emery grinders, circular-saw tables, button lathes, polishing lathes, turning lathes, metal-spinning lathes, wood-turning lathes, drill chucks, &c.

AT THE Milwaukee Industrial Exhibition the Northwestern Terra-Cotta Co., Chicago, through their resident agent, Mr. C. H. Ross, make a very handsome display of goods of their manufacture. The exhibit includes many stock designs, as well as specimens of special work.

THE EGAN CO. forward us a copy of a letter received from the Knoxville Furniture Co., Knoxville, Tenn., commendatory of the 30-inch double-drum sanding machine which they have had in use for some time. The company praise the construction of the machine and its efficiency in all particulars.

FROST ON SHOW WINDOWS is a great annoyance in winter time, and how to escape it is a problem presented to every builder. The Utica Steam Gauge Co., in another column, call attention to their method of overcoming this difficulty.

ALBERT B. FRANKLIN, of 30 Charlestown street, Boston, Mass., has issued a neat circular describing the specialities for which he is agent. Mr. Franklin describes his business as that of steam-heating engineer and contractor, and the special goods to which he directs attention are Gold's improved boiler, the pin indirect radiators, Breckenridge's automatic air-valves, Reed's direct radiators, the globe boiler and Reed's shaking grate. These goods are illustrated in the pamphlet mentioned.

Swiss Wood-Carvers.

A writer in one of the daily papers has been investigating the work of Swiss wood-carvers as produced in this country. While in the main the skill of these ingenious artisans is expended upon toys and novelties of small importance and of little artistic value, they occasionally manifest an ability to copy from nature and produce floral pieces which might well serve as models for more ambitious sculptors. An account of what they do is of interest to our readers as indicating the skill that is achieved by long practice, and that comes in part from whole communities devoting their attention to a single pursuit. The article referred to is as follows:

Over the doorway of a building on the west side of New York City is a sign which reads "Artistic Bric-a-brac." In a small square room, up one flight of stairs, were several tables ladened with many curious and interesting productions of German and Swiss artists. "The Swiss peasantry are the greatest wood-carvers in the world," the proprietor said. "Carving seems to be as natural with them as eating. They carve out of wood, with wonderful ingenuity, anything from a simple paper-knife to an elaborate piece of architecture in miniature. Aside from wood-carving and some other mechanical occupations they are not good for anything, being very simple, ignorant people. But they have a genius for carving, and have a natural skill for copying from nature. Their floral pieces are regarded as masterpieces, and serve as models for young sculptors. It is only necessary to furnish them with a photographic design of what is wanted. Most dealers who import Swiss carvings do this, although the Swiss peasantry produce numberless things themselves without the aid of any suggestions. They carve out of wood almost every kind of fancy articles, such as ink-stands, nut-crackers, jewelry cases, cuckoo clocks, ladies' work-boxes and a large number of other things, too numerous to mention. The tools they use are very simple, the carving being all done by hand. The articles they carve are ingeniously ornamented with leaves and flowers, and some of their designs are extremely odd; they are always artistic. Here is a piece of carving in the shape of a nut-cracker. It is a lifelike representation of a bear on its haunches. Of course it is made more for ornament than use, but its artistic merit is worthy of careful study. The Swiss have a knack of turning the most simple article into a real work of art. Take this book-rack, for instance," and the dealer produced a very simple form of book-holder for the library table, having two side pieces on a sliding base; "see how artistically the side pieces are carved, showing in bold relief a double rose surrounded with a mass of leaves and vines. One advantage the Swiss have is the wood which they use. This is remarkably fine and free from knots, and a tool cuts it as easily across as with the grain. The kind mostly used is known to the trade as peach-wood, which it closely resembles in every respect. Another kind of wood which is largely used is called satin wood. This has a pure white color, and, like the other variety, is entirely free from knots and peculiarly even in respect to hardness."

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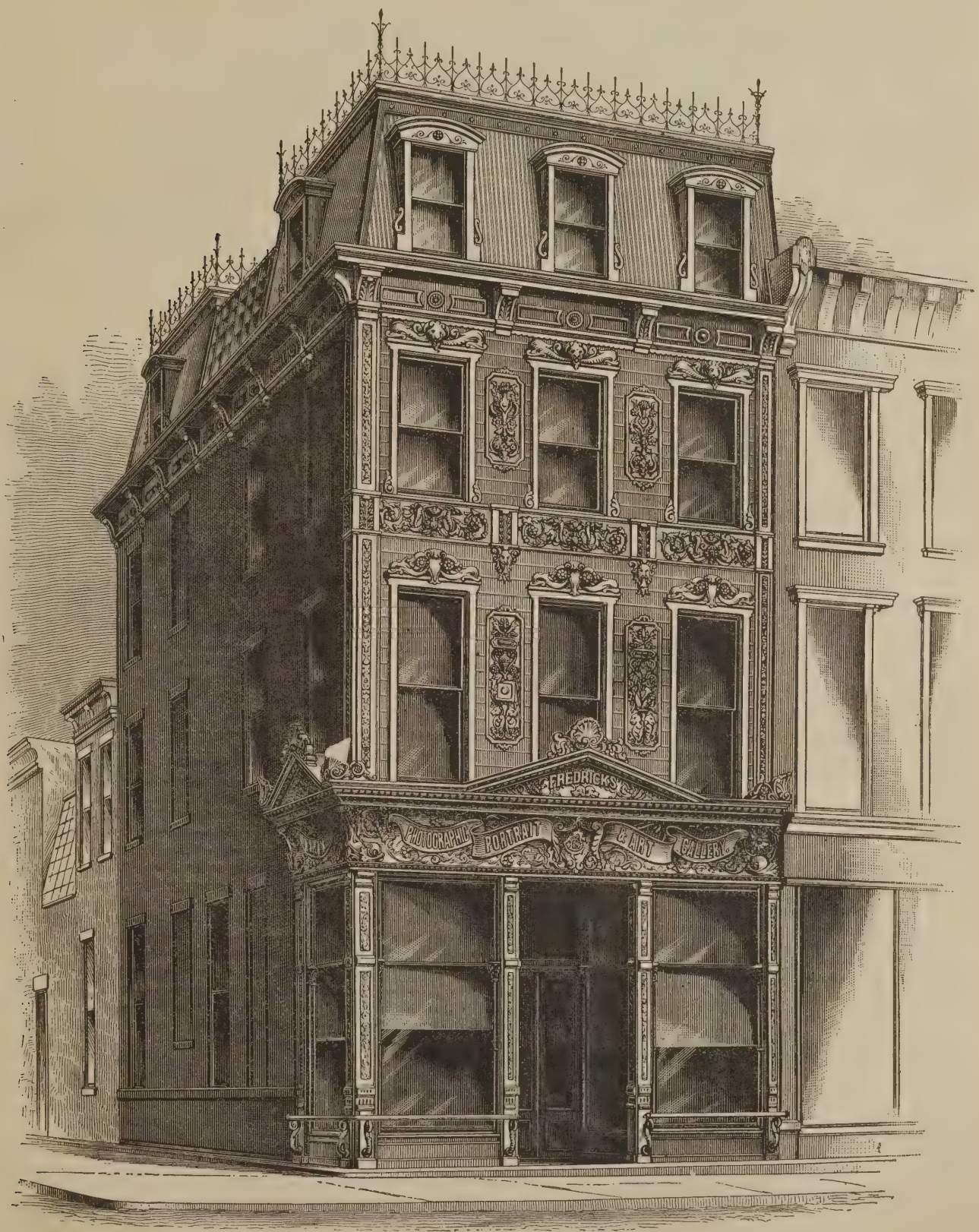


REMODELING OLD BUILDINGS.—FREDERICKS' ART GALLERY, CORNER BROADWAY AND NINTH STREET, NEW YORK.

Remodeling Old Buildings.

In every progressive city, especially in those districts where trade encroaches upon what were formerly residence streets, there is a constant demand made upon builders to remodel old buildings so as to give them the semblance of modern structures, and at the same time afford the necessary conveniences for the business to be transacted. For the most part, on the score of economy, the walls and floors are retained intact. The first story front, however, will be torn out, and an iron girder will be run across to carry the weight of the wall above it. While this is being done the weight of the wall will be carried by shoring. Very handsome plate-glass show-windows will be fitted between columns of appropriate design, and perhaps a little colored glass will be employed in the upper sections to enhance the general effect. An elaborate cornice will finish the new work at the top. The windows in the upper stories will possibly be embellished also, and in some cases the main cornice of the building will be replaced by something new. In most instances, however, the new work, so far as the exterior is concerned, is restricted to the store front. Accordingly many buildings are to be seen in certain portions of New York and other cities which in their architectural and decorative features are far more elaborate in their lower portions than toward the top. Many anomalies will be found, buildings in which French Renaissance, for example, characterizes the lower story, while all above is severely plain, in some instances there being not even a cornice to finish the front wall.

Our first-page illustration shows how old business buildings on Broadway are sometimes remodeled. The building stands on the corner of Broadway and Ninth street, and for many years past has been of no particular prominence in the neighborhood in which it is located. Recently it has been refitted for the occupancy of Fredericks, the well-known photographer and artist, and in its rejuvenated form presents the appearance indicated in the engraving. It is of interest to the general reader for several reasons. In the decorations which have been applied, particularly about the lower cornice, the belt course between the second and third floors, and the panel pieces on the front, a kind of decoration known as "Solid Relief" has been used. A mansard story has been added, in the construction of which sheet metal has been freely employed. It will be noticed that the most elaborate decoration occurs near the lower part of the building, and that as the top is reached the decorations become less prominent. The walls are capped by a very plain galvanized-iron cornice, while a still plainer corrugated-iron roof, with dormer windows and cresting of the cheapest possible character, constitute the upper story. The case is a typical one, and our readers, now that their attention has been directed to this matter, will have no difficulty in finding many other instances where the same relative arrangement of ornamentation has been followed.

The decorative material known as Solid Relief was supplied by Artmann & Fechteler, of No. 966 Sixth avenue. This style of decoration, which was patented some years since, has been for some time past largely employed in the interior decorations. More recently it has been applied to the exterior finish of buildings, and several prominent examples in addition to the one here shown might be named. It is claimed to be waterproof and extremely durable. The base is plaster-of-paris, and in the formation of the individual ornaments a texture of strong cloth or canvas is employed for holding the different parts together and preventing a complete disintegration in case a fracture occurs in the manipulation. After the ornaments have been prepared they are treated to a hot solution of oil, turpentine and liquid dryer. This compound enters into the pores of the plaster-of-paris, and, as the inventor asserts, gives the same a wax-like structure, whereby its brittleness is removed and easy breakage avoided. It is asserted, further, that the plate thus dipped in oil becomes harder in the course of time, and that ultimately it becomes so hard as to make it practically impossible to break it by the ordinary uses to which the decoration is put. The facility with which it may be manipulated and the ease with which very intricate foliated ornaments may be produced, to say nothing of panel-work, acroterie and other forms, is clearly indicated in our engraving. At best, however, a woodcut gives but a poor idea of ornamental work of this character, and to be really appreciated it must be examined for itself. The material seems well adapted for the purpose, and its employment is likely to increase.

Other features about this building might be referred to in detail, but the engraving shows them sufficiently to save the necessity of elaborate description. The decoration of the interior, which is also elaborate, employs Solid Relief, and the effect is hightened by the judicious use of colors, bronze, &c. The upper panels of the show-windows, also the transom over the door, are filled with colored glass, which not only adds to the attractiveness of the exterior, but also lends an effect to the interior.

Brick and Tile.

More or less of the history of brick and tile making can be traced from the year B. C. 2500 to the present time. With the exception of bronze, says an English contemporary, brick-making is the most ancient manufacture of which we have any record. The earliest mention of bricks occurs in the Book of Genesis, where we are told that the immediate descendants of Noah went east and settled in the land of Shinar, and dwelt in a stoneless plain, where they "made bricks and burnt them well and had them for stone, and built with them a city and a tower whose top might reach to heaven." A quantity of these same bricks—or, at any rate, some of their immediate descendants—were found by Layard at Birs Nimrud, which, according to a large amount of current testimony, was the site of the city of Babylon and the "tower whose top might reach to heaven." The date of the painted and enameled kiln-burnt bricks found at Birs Nimrud by Rich, Layard and other travelers is only conjectural, and when we get to Egypt we can speak with more certainty. The late Walter Thornbury, in his "Ten Courts of the Crystal Palace," graphically describes the wonderful influence which climate and locality have upon architecture. Egypt, especially the more southern part of the country, was almost rainless and stoneless; hence the first Egyptian builders had to fall back on simple sun-dried bricks, baked in the sun; but, the brick earth which they had at their disposal containing very little clay, they were compelled to mix in chopped straw or hay in order to make them adhere together. The climate being exceptionally dry, there was no need to bake them at first, but afterward, as more rainy and fertile Delta became populated, the kiln began to be used.

At first, as Sir Gardner Wilkinson tells us, the use of crude bricks baked in the sun was universal both in Upper and Lower Egypt, the method of transporting stone and granite to long distances being unknown; and even in later times all private and public buildings, tombs, inclosures, granaries and even fortifications were built of brick, stone being reserved for the magnificent temples of the larger cities and towns.

The demand for bricks was consequently enormous, and the clever chancellor of the exchequer of one of the earliest Pharaohs soon saw that he could very easily increase the credit side of his budget by making brick-making a Government monopoly. The Government of that day, seeing the profit which must accrue to the revenue from a brick monopoly, undertook to supply the public at a moderate price—less, in fact, than that for which they could obtain the same materials from an ordinary brick-maker. This they effected by employing their captive slaves to do the work for their food and lodging, such as they were. Not only this, they farmed out the manufacture of particular districts to the Brasseys and Petos of the time. or bestowed the privilege on their victorious generals or other great men. In order to secure the monopoly, the seal of the king or of the great man upon whom the monopoly was bestowed, in return for money or valor, was stamped upon the bricks at the time they were made. This fact, although not vouched for by any ancient author, is gathered from finding bricks so marked, both in public and private buildings, some having the ovals of a king, or the name of a hero or priest impressed upon them. It is also probable that certain individuals were allowed to manufacture bricks for their own consumption.

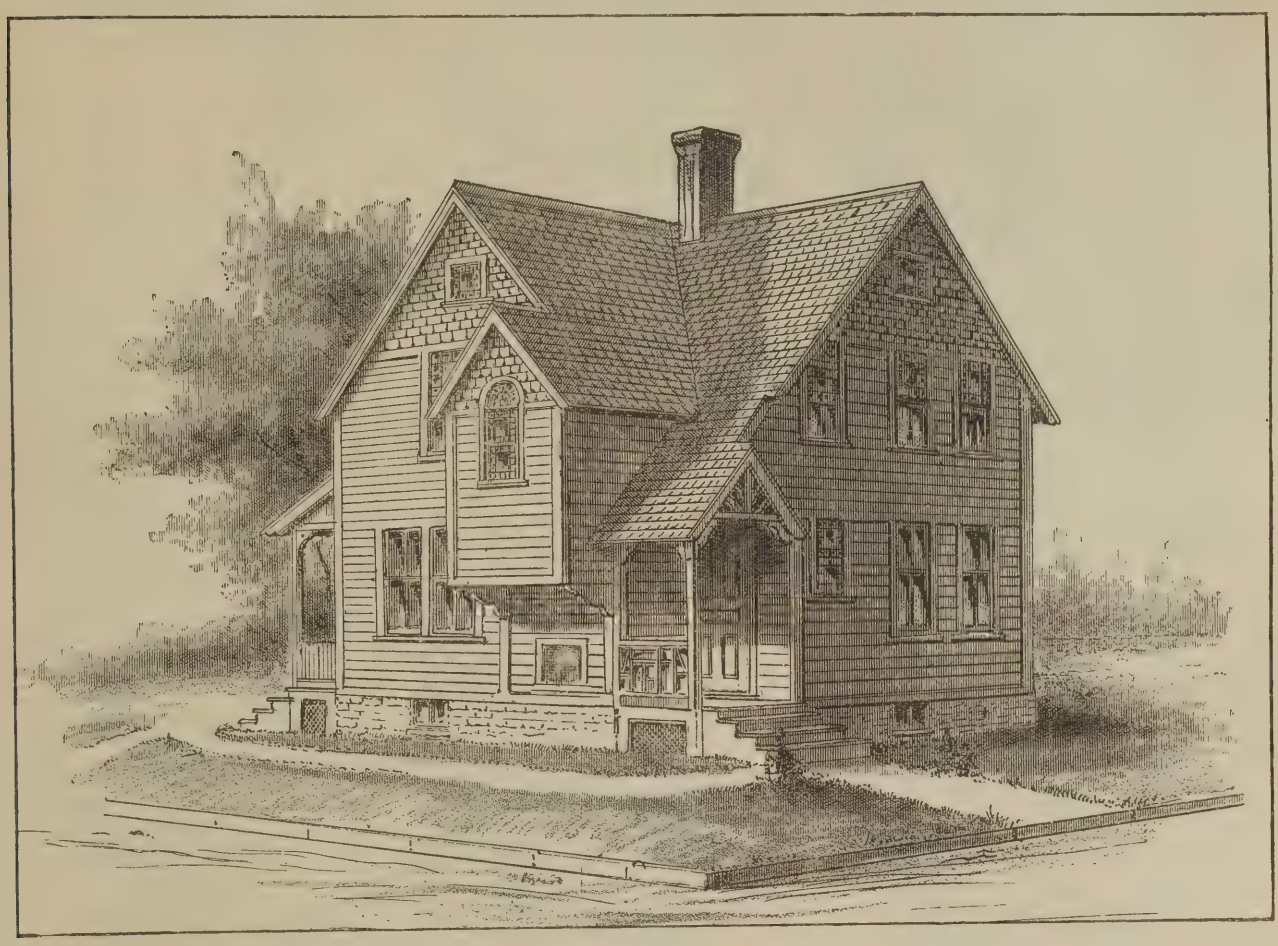
Truly there were strong men before Agamemnon, and great chancellors of the exchequer before Lewis and Gladstone, Childers and Hicks-Beach. Not only were the captives taken in battle compelled to work in the Egyptian brick fields, but also the foreigners sojourning in the Land of the Pharaohs. The Jews, we know, were not exempted from this drudgery, which was made all the more irksome and laborious by the quantity of chopped straw with which the bricks were bound together being limited or withheld altogether, so that they had to procure their own how they could. Not only this, they were compelled to act as bricklayers and builders, for we know that they erected granaries, treasure cities and other public buildings, and from recent discoveries it is highly probable the ancient town or city built on the site of Telel-Kebir was erected by the Jews while in "the house of bondage." In the Egyptian sculptures we have several examples showing the method of manufacture, although we have no proof of the Jews being represented performing this species of drudgery.

In Sir Gardner Wilkinson's "Manners of the Ancient Egyptians" (vol. i, page 344) there is a most interesting cut, which is a copy of a wall painting at Thebes, showing the whole process of brick-making, with all the graphic *naïveté* for which the old Egyptian artists were so celebrated. The original is in the tomb of Rekmara, an officer of the court of Thothmes III, who reigned about 1490 B C., and was contemporary with Moses. The whole scene, were it not for the physiognomies of the captives, might depict the condition of the Hebrews in "the house of bondage." The taskmasters stand ready with their whips and sticks. Some of the slaves are digging out the clay with picks, while others are mixing it to the proper consistency with water which a third party is bringing from a tank surrounded with trees, the surface of the water being covered with broad-leaved lotus plants to prevent evaporation. In another part of the picture more slaves are transferring the tempered clay to pans, from which it is emptied on to the ground within reach of the molder, while others are carrying away the molded bricks and laying them in rows to dry. Dr. Birch, in his great work on "Egyptian and Oriental Pottery," gives a cut of a brick from Thebes, stamped with the hieroglyphic of the name of Thothmes III—a scarabæus; also of one of the stamps themselves, bearing the name of Amenophis III, one of his immediate successors. Thothmes III appears to have been the principal royal brickmaker of Egypt, the reason being that, owing to his immense conquests, he captured more prisoners than his fellow-rulers.

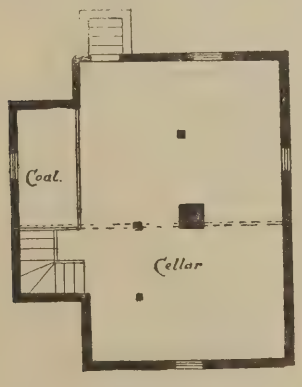
Captain Watkins, in his "History of Egypt" (vol. i, page 185), tells us that the brickmakers seem to have been treated with great cruelty, but that the bricklayers had even a worse life of it. According to an inscription of the period he appears in two instances at least—personal uncleanliness and parental severity—to have resembled his brethren of to-day. "I will tell thee how the bricklayer fares," says the writer in stone. "Disease makes a cripple of him, for he is exposed to the winds when he builds with labor. His two arms are worn out with work, his clothes are in disorder, and he only washes himself once a day. He is like a piece on a draft-board, which is moved from one compartment to the other—a draftsman that is moved about from one month to another on the beams of the scaffolding. There he does all his work, and when he has earned his bread he returns to his own house and beats his children."

Cheap Frame House.

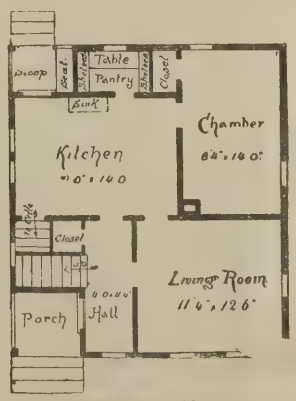
The accompanying perspective, floor plans, elevations and details show a frame house, the cost of which is estimated by the author of the study to be in the neighborhood of $800. The design has been prepared by Mr. John Wees, of Bridgeport, Conn. As a study the work has been carefully considered, both in the arrangement of the rooms and in the constructive and decorative features. From Mr. Wees's letter accompanying his plans we gain several items that will be of interest to our readers. He refers particularly to the compactness and convenience of arrangement of the rooms on both floors and the abundant supply of closet-room. The rooms on the first floor are so disposed as to make slight changes possible which will adapt the house to a somewhat different use from that indicated in the plans. For example, a family that does not require the down-stairs bedroom could use the room that is now marked "chamber" as a kitchen, and could employ what is at present marked "kitchen" for living and dining room. The present living-room would then become a parlor or a reserve room, as circumstances may require. This change could be accomplished in several different ways. It is hardly necessary for us to speculate as to changes, however, but instead we should submit the author's study as he has sent it, leaving our readers to form their own opinions. The rooms on the second floor are compactly arranged, with ample closet space in each, with a large storeroom opening off the hall. The stairway is generous, but does not take up unnecessary room, and is very conveniently located. The exterior design speaks for itself. It is neat in its general features, and is well adapted for the covering of such an interior as we have described. From a bill of quantities furnished by the architect we extract the following items: Excavation, 72 yards; stonework, 675 feet; brickwork, 4000; plastering, 375 yards; timber in frame, 4300 feet; shingles for roof and siding, 10,000; clapboards, 1325 feet; ⅞-inch pine, 1475 feet; spruce flooring, 800 feet. Mr. Wees informs us that in the neighborhood of Bridgeport a number of houses which are the essential equivalents of this have been built at prices ranging from $750 to $850.



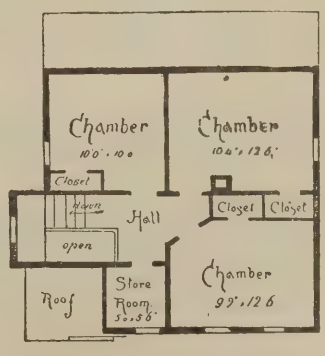
PERSPECTIVE VIEW OF CHEAP FRAME HOUSE, DESIGNED BY JOHN WEES, BRIDGEPORT, CONN.



Foundation Plan.



First Floor Plan.



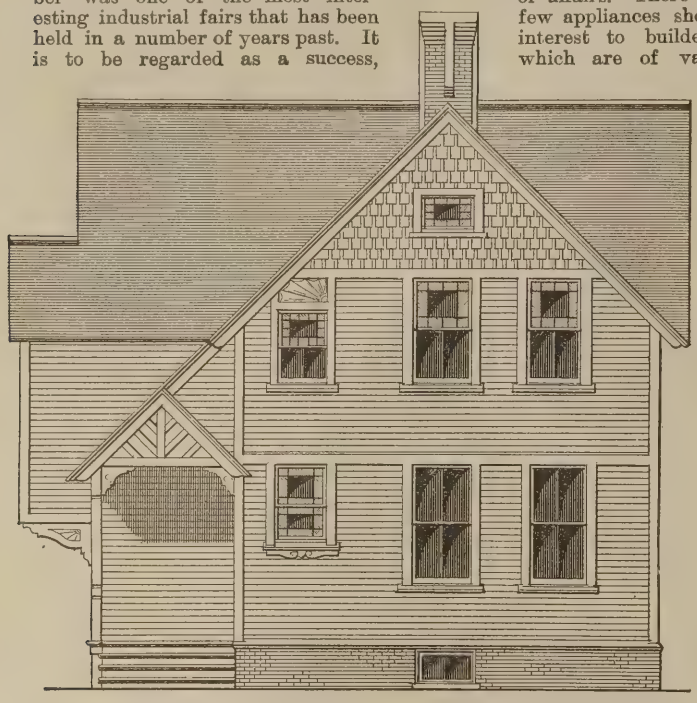
Second Floor Plan.

Foundation and Floor Plans of Cheap Frame House.—Scale, $\frac{1}{16}$ Inch to the Foot.

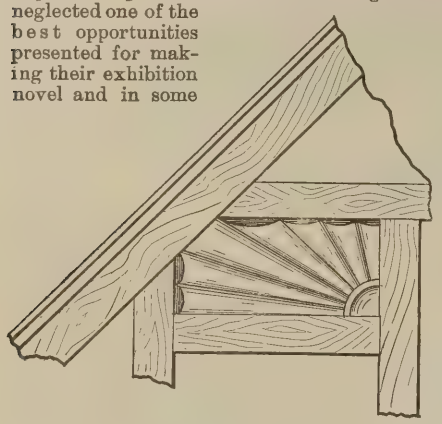
One of the daily papers published in Philadelphia, that has been closely watching the results of manual training in the schools so far as developed, directs attention to a very interesting fact. It declares that unruly or dull boys in the ordinary classes of book learning are generally found to be eager for and expert at mechanical work. Although this development appears to have caused some surprise among the school teachers, it is really but a reflex of the condition of the world outside the schoolroom. There is no occasion for any protracted moralizing on the subject, but it may be cited as a proof of the advantages of the industrial system that by its means much youthful time which would otherwise be frittered away in rebellious contests with book learning may be turned to advantage in congenial employment that will better the future condition of the individual and the community.

NOTES AND COMMENTS.

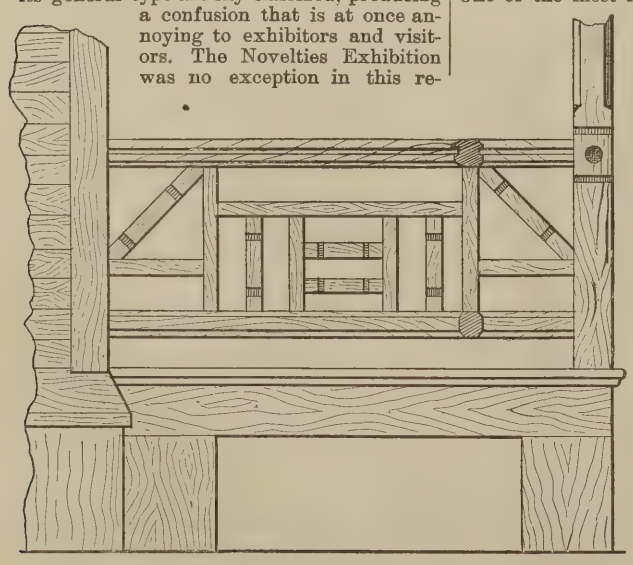
The Novelties Exhibition which was held in Philadelphia during September and October was one of the most interesting industrial fairs that has been held in a number of years past. It is to be regarded as a success, although it was open to criticism in several important particulars. The management neglected one of the best opportunities presented for making their exhibition novel and in some respects unprecedented. Almost all fairs of its general type are illy-classified, producing a confusion that is at once annoying to exhibitors and visitors. The Novelties Exhibition was no exception in this respect. Pop-corn and oil-cloths, sheet-metal goods and steam pumps, electrical apparatus and musical instruments, were to a certain extent indiscriminately mixed. The shape and character of the building in which the exhibition was held were no doubt in part responsible for this state of affairs. There were comparatively few appliances shown which were of interest to builders. Some of those which are of value to our readers are described among our "Novelties" in this issue.



Cheap Frame House.—Front Elevation.—Scale, ⅛ Inch to the Foot.



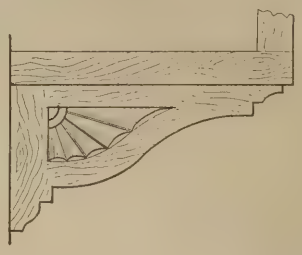
Panel Over Window in Front.—Scale, ½ Inch to the Foot.



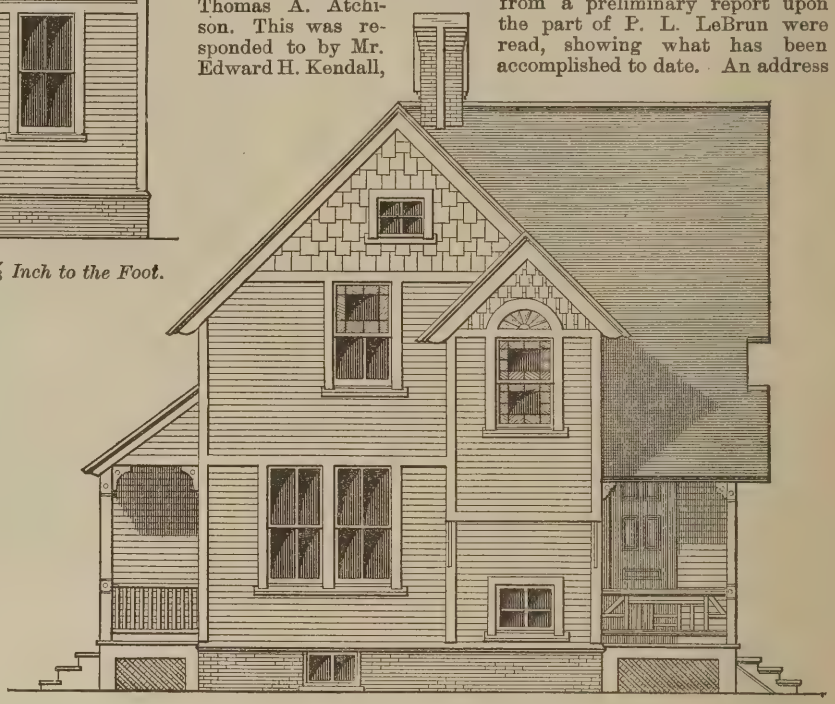
Detail of Front Stoop.—Scale, ½ Inch to the Foot.

The nineteenth annual convention of the American Institute of Architects was held at Nashville, Tenn., during the third week of October. The attendance was not large, but was representative. The Institute was welcomed at Nashville by an address by Dr. Thomas A. Atchison. This was responded to by Mr. Edward H. Kendall, of New York, first vice president of the organization, who presided in the absence of Mr. Walter, of Philadelphia, the president. Following this address was the reading of the report of the Board of Trustees. One of the most important features of this report was a recommendation near its close in the following terms: "It would seem desirable that some effort be made to bring about a closer relationship between the architectural associations of this country. To this end it seems but proper that some advance be made by the American Institute of Architects, as the oldest organization of architects on the continent. As a means to that end it would seem desirable that this convention take some action looking to a representation, through a regularly appointed delegate, at all conventions of architectural societies throughout the Union, and that such be requested to send each a delegate to all conventions of the A. I. A."

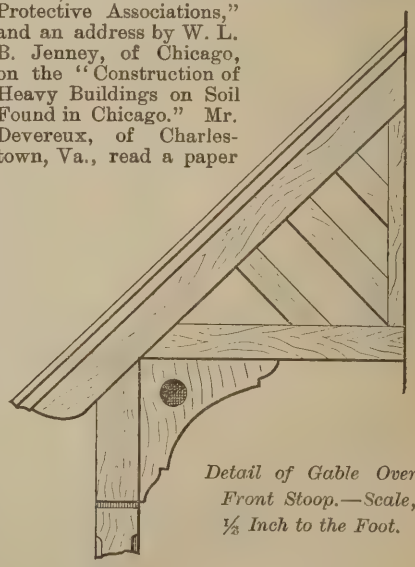
Reports were read from different chapters, including that of Boston, Chicago, Cincinnati, Indiana and New York. In the latter reference was made to the effort made in Congress toward an improved system of Government architectural service. Attention was also given to the new building law in New York State, and also to the work so far accomplished by the Willard Architectural Commission, laboring in the interest of a trust fund bequeathed by Mr. Willard to the Metropolitan Museum of Art. Extracts from a preliminary report upon the part of P. L. LeBrun were read, showing what has been accomplished to date. An address was delivered by Mr. E G. Lind, of Atlanta, bearing the title of "Color and Music." At the second day's session a paper was read by Mr. Brown, of Washington, on "Architecture and Bacteria;" a paper by J. M. Clark, of Boston, on "Architects' Protective Associations," and an address by W. L. B. Jenney, of Chicago, on the "Construction of Heavy Buildings on Soil Found in Chicago." Mr. Devereux, of Charlestown, Va., read a paper on the "Construction of Cyclone-proof Houses." The election of officers resulted in the choice of the following: President, Thomas U. Walter, LL.D., Philadelphia; treasurer, O. P. Hatfield, of New York;



Bracket Under Projection on Side.—Scale, ½ Inch to the Foot.

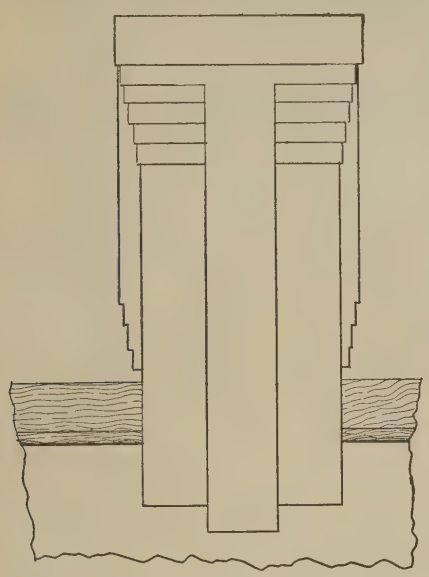


Side Elevation.—Scale, ⅛ Inch to the Foot.



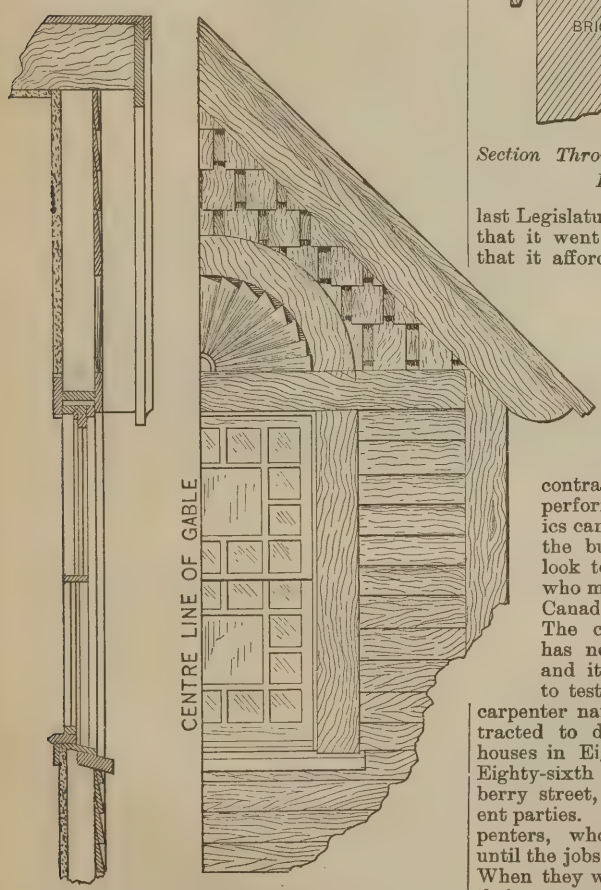
Detail of Gable Over Front Stoop.—Scale, ½ Inch to the Foot.

secretary, George C. Mason, Jr., of Newport, R. I.; Board of Trustees, H. M. Congdon, E. L. Littell, Napoleon Le Brun, A. J. Bloor. Committee on Publications—H. Hudson Holly, New York; J. M. Clark, Boston; Charles Crapsey, Cincinnati; J. M. McArthur, Jr., Philadelphia. Committee on Education—Alfred Howe, Providence; Henry Van Brunt, Boston; Prof. N. Clifford



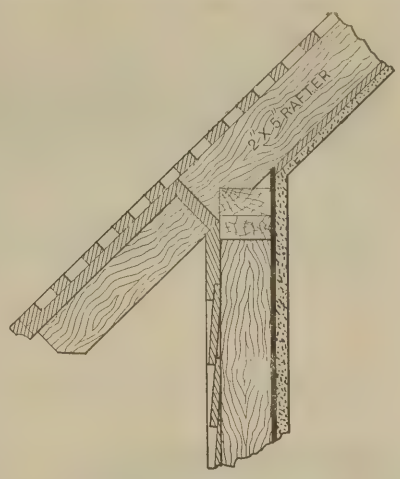
Cheap Frame House.—Chimney.—Scale, ½ Inch to the Foot.

Ricker, of Illinois; Prof. W. R. Ware, New York; J. M. Clark, Boston. Secretary of foreign correspondence, W. L. B Jenney, Chicago. Considerable time of the session was devoted to the discussion of amendments to the proposed bill for the erection of public buildings. The result was the adoption of several important amendments in the bill that will be proposed in Congress



Section and Half Elevation of Gable in Side Projection.—Scale, ½ Inch to the Foot.

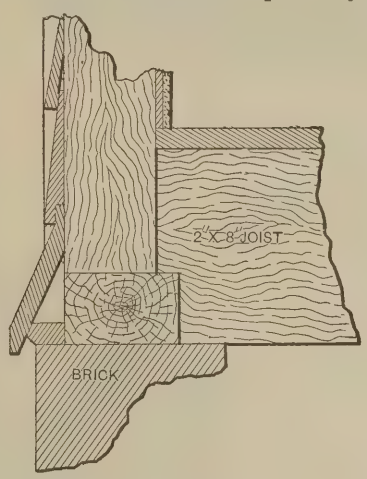
at the coming session. The meeting adjourned with a resolution of thanks to citizens and various institutions of Nashville for hearty and graceful hospitality to the Institute. A handsome and enjoyable ban-



Section at Eaves.—Scale, 1½ Inches to Foot.

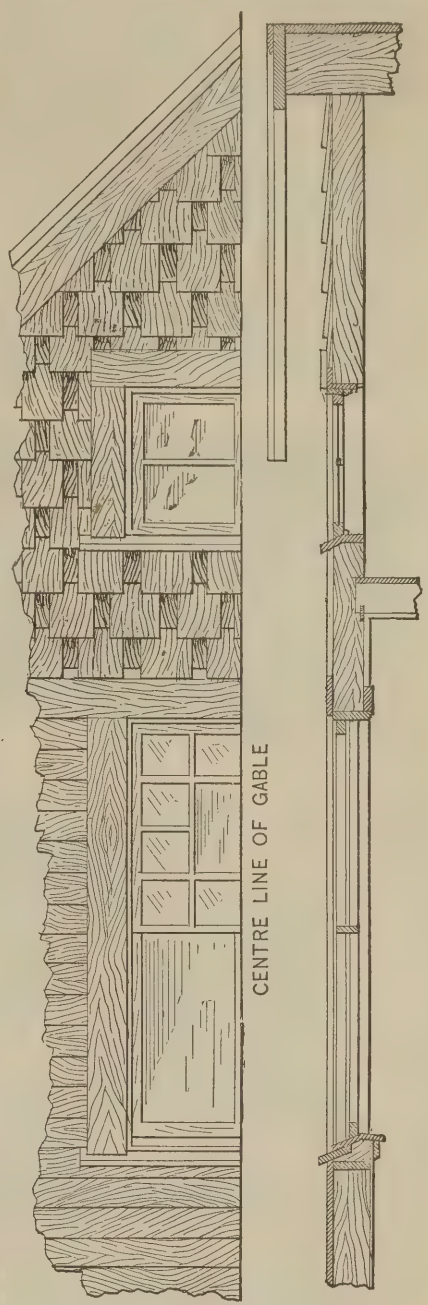
quet tendered by the Art Association and citizens of Nashville was the feature of the close of the session.

We reviewed at some length the mechanics' lien law which was passed by the



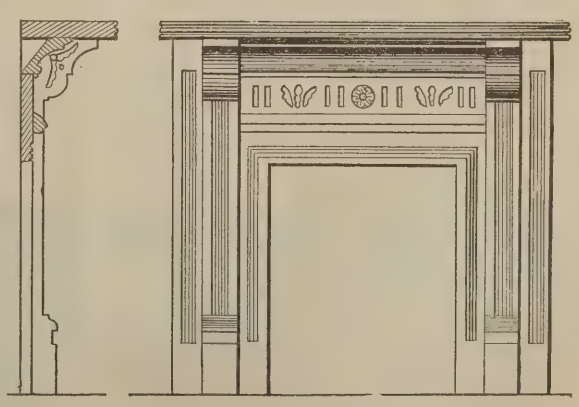
Section Through Water Table.—Scale, 1½ Inches to the Foot.

last Legislature in this State, about the time that it went into effect. It was supposed that it afforded much better protection to mechanics and laboring men in the building trades than anything that had preceded it. From the present outlook, however, it would seem that workmen are not much better off than they were before it was enacted. It appears that, if the owner of a building can prove that he has paid the contractor for the work performed, the mechanics can have no lien on the building and must look to their employer, who may be on a visit to Canada or Kamschatka. The carpenters' union has now such a case, and it is the intention to test the bill. A boss carpenter named Britton contracted to do the work on houses in Eighty-fifth street, Eighty-sixth street and Mulberry street, owned by different parties. He hired 35 carpenters, who worked along until the jobs were completed. When they went to look for their wages for the last two weeks, amounting to $1900, Mr. Britton could not be found. They then made a demand on the owners, but they showed receipts for the money in full of demands, and refused to again pay, and the men appealed to the union. Their wages were made over to Walking Delegate Owens, who has employed Mr. Myron H. Oppenheimer to begin action



Front Gable.—Scale, ½ Inch to the Foot.

against Messrs. Brandon, Haverman and Schuyler, the owners of the property. This will test whether the mechanics' lien

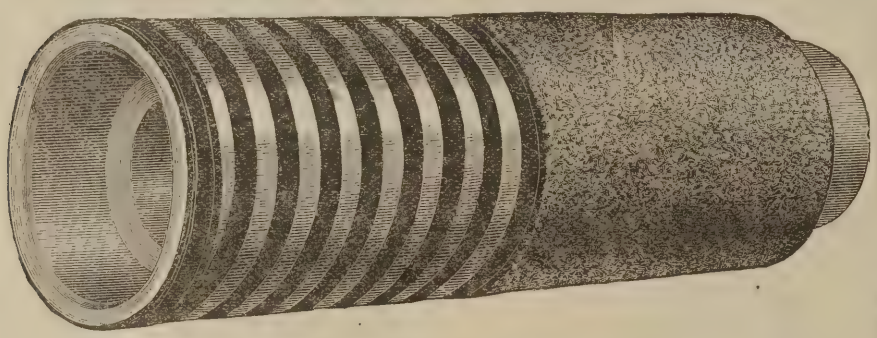


Mantel.—Scale, ½ Inch to the Foot.

law is of any effect, so far as they are concerned. Other building trades will look on the case with interest, as its just settlement is a very important matter.

Wooden Water-Pipes.

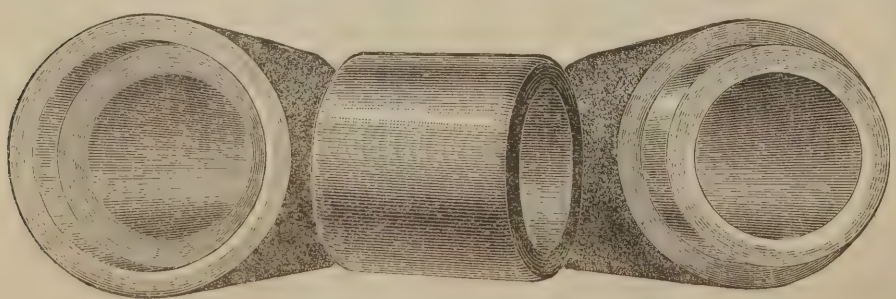
Although cast iron is in very general use for distributing-pipes in connection with water-works, wooden pipe has by no means been superseded. It is employed with great satisfaction in many cities and towns, and from testimonials which are exhibited by the manufacturers of this material it frequently stands tests which show that although it has been practically discarded in certain sections of the country it is still no mean rival of other materials for the use named. The accompanying illustrations show the form of wooden pipe that is being put upon the market by the Michigan Pipe Co., with general office and works at Bay City, Mich. The pipe is of the variety known as the Wykoff, the general features of which are clearly indicated by the first engraving. The pipe is made in sections of about 8 feet each from white-pine logs. These are first bored with an auger of the required size.



Wooden Water-Pipes.—General View, Showing Construction of the Wykoff Wooden Pipe.

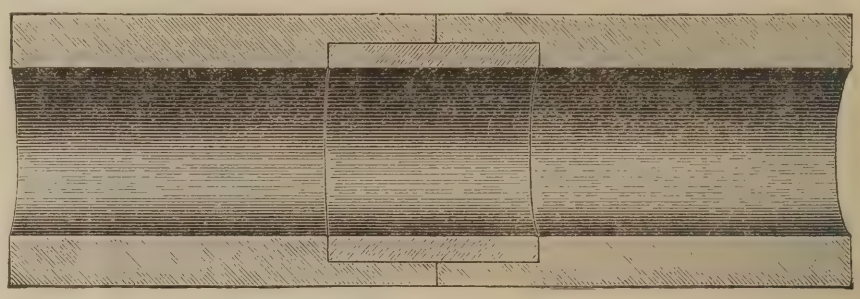
The outer surface is then removed by placing the log in a turning-lathe which reduces it to uniform size and frees it from sapwood. The pipe is next thoroughly seasoned and is then taken to a machine called the "bander" where the hoop-iron collar indicated in the engraving is spirally wound and pressed on by steam-power. In order to make this band-iron protection of the pipe as secure as possible the iron is wound three or four times around each end of the section, thus making the chamber of the joint stronger than any other part of the pipe. The band of iron while being applied passes through a preparation of asphaltum, which gives it a coating under as well as over the band. The pipe is next tested, after which its entire surface is given a heavy coat of asphaltum, thus preventing any corrosive substances from reaching the bands which strengthen the pipe.

The company have been very ingenious in devising means for the use of this pipe. For connecting different lines of pipe at street crossings, and for connecting hydrant-pipe with mains, special castings are employed, the bell ends of which are bored out smooth, allowing the thimble joint connection to be driven in closely, thus forming a perfect joint. Service-pipe connections are made by boring between the bands with an extension bit. A corporation cock, which is made with a long, coarse thread for the purpose, is then screwed in place. A piece of lead pipe with a nipple on the opposite end is wiped on to the nipple of the corporation cock. Wood service-pipe in turn is connected with the nipple by an iron connection, or the nipple may be screwed into the end of the wood



The Parts Used in Making a Joint.

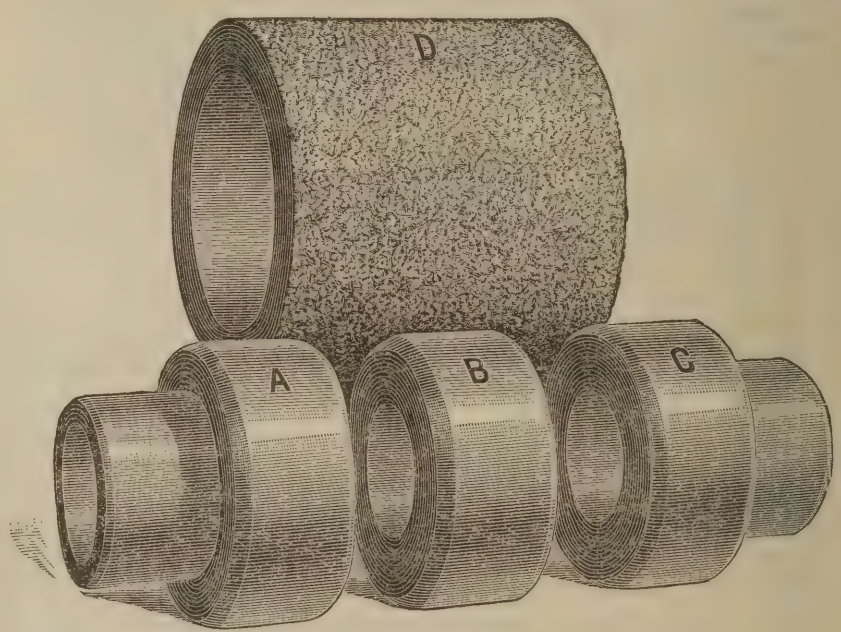
service-pipe. To remove a piece of pipe in a line, for the purpose of inserting special castings for branches or for other purposes, a sleeve of the general character shown in the second engraving is employed. The exact length of the pipe to be taken out is first obtained, thus giving the space to be filled by the sleeve of the article to be inserted. In placing, the sleeve D is slipped over one end of the main in the ground. The pipe to be put in is then joined to the opposite end of the main, leaving a space of about 1 foot to be filled by the sleeve. The tenon end of the reducer A is then pressed into the end of the main through the sleeve D, making a joint in that end. The reducer C is similarly fixed in the end of the piece of pipe just placed. The space between the two is then filled by the piece B, when the sleeve D is passed back over the whole connection,



Longitudinal Section Through Joint.

thus completing the joint and making it tight. The manner of making ordinary joints is also indicated in the engravings. The thimble or connecting piece is 8 inches long, made of seasoned timber turned smooth, and being in diameter about ⅛ inch larger than the mortise of the pipe. This increase in size is for the purpose of compression when the sections are driven together, thus securing a perfectly tight joint without packing of any kind.

The advantages claimed for the Wykoff wooden water-pipe, which has been in practical use for a considerable term of years, may be summarized as follows: It is cheap, durable and easily attached for service-pipe connections, and has the advantage of being not liable to get out of order. The water conveyed through the pipe is purer than through other materials. The expense of laying is less than with other kinds of pipes, and the water passing through wooden pipe is less liable to freeze than passing through other pipe. Should the water freeze by any accident, the elasticity of a wooden pipe is sufficient to prevent bursting. The elasticity of the pipe also renders it less liable than other water-pipe to burst under the hammer action of a pump or the sudden pressure that is caused by closing hydrants quickly.



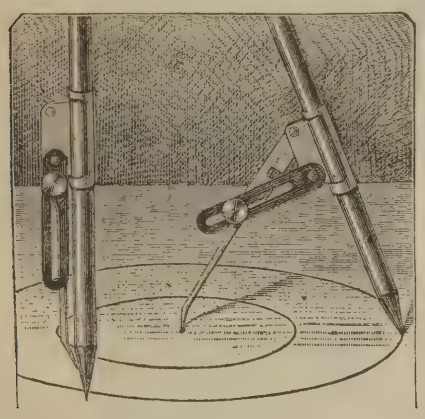
Parts Employed in Making Connections, &c.

A floor or ceiling the boards of which are interlocked by means of metallic binding strips has been patented by C. Butcher, of Boston, Mass. The floor boards are made with square edges, and these edges are split or divided for their whole length by a horizontal groove. The groove is made near the bottom side of the board, so that the upper lip is somewhat thicker than the lower one. A thin metal strip is placed into the groove of the first board, and projects outward to one-half its width. Slots within the strip receive nails which are driven through the lower lip and also through the lower floor or joist. After the first board and

metal strip are thus secured in place the next board is slipped over the projecting portion of the strip and is driven up tight against the first board. In this way the entire floor or ceiling is laid.

Drawing Compass.

In one of our exchanges we find the following brief description of a very simple and serviceable tool which makes a compass for ordinary work out of a common pencil. The holder is a split cylinder, through which the pencil passes and is held in any position desired by the pressure of the spring. At the



Drawing Compass, Open and Shut.

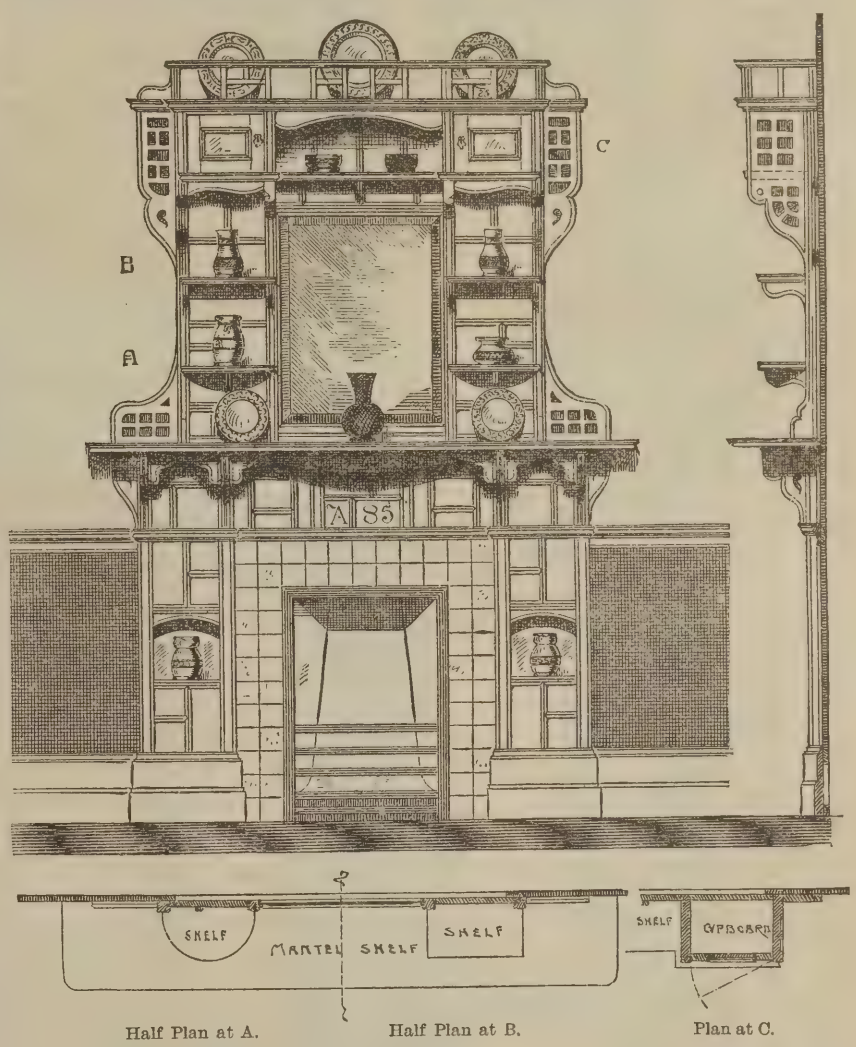
left of the illustration the compass is shown closed. When thus shut up it occupies but little space and can be carried conveniently in the pocket without any danger of tearing the clothes, as the point, which is bent, as shown, lies directly against the pencil. At the right of the illustration the compass is shown open and in position for describing circles. The construction of the compass is clearly indicated in the cut. The pencil holder and point are hinged together at the top and connected lower down by a slotted arm fastened by a rivet to the pencil-holder at one end, while at the other is a thumbscrew which slides in the slot and admits of the compass being fastened at any angle. Besides the advantages of simplicity and compactness the compass is further recommended for ordinary use by the fact that it carries an ordinary lead pencil which is easily adjusted to any length.

An English Strongroom.

In an English exchange we find the following description of a steel strongroom for banking purposes recently built by Messrs. Chubb & Sons, London, which is said to exceed in weight and dimensions all previous records. The dimensions of the strongroom are as follows: 50 feet by 14 feet by 10 feet high. Nearly 100 tons of metal have been used in its construction; nearly 90,000 holes have been bored, countersunk and tapped to receive screws, and its capacity is declared to be equal to 1250 tons weight of gold bullion, or, say, about £110,000,000. In the construction special regard has been had to obtain a maximum of toughness and hardness, so as to withstand drilling or the force of blows, and to fulfill these conditions a triple series of plates compose the thickness of the walls, making them altogether 1¼ inches thick. The middle plate is specially hardened to resist the action of drilling, and the outer ones to withstand the impact of blows. All the exterior walls are stiffened and strenghtened with angular and T-section steel ribs, and the corners have been prepared in cast steel, so as to secure that degree of solidity which the weight of the structure itself demands. The strongroom is divided into three compartments, the partitions between having a filling of a fire-proof composition to prevent the spread of fire should such an occurrence take place, and a manhole gives access from one room to the other in case of necessity. Three massive doors and grills give entrance to the strongroom, the weight of each door approaching 30 cwt., and they are hung on hardened steel pins, with a provision for lubrication, the opening and closing operations being exceedingly easy considering the enormous weight which is put in motion. The grills are locked automatically immediately the gate is closed, a special arrangement being devised for securing the folding action at the top and bottom as well as in the center. The doors are secured with patent diagonal bolts, which on being thrown enter the frame in dovetail fashion, and actually draw it so as to form part and parcel of the door itself, thus offering an impediment to the use of wedges which increases in resistance as the wedges are driven in. Although the bolts weigh 2 cwt., the arrangement has been so skillfully balanced and manipulated that they are thrown out and in with the greatest ease. The whole is composed of steel with the exception of the shelves and fittings, which are of iron.

Anglo-Japanese Mantel-Piece.

The accompanying illustration represents what one of our English exchanges describes as a mantel-piece in the Anglo-Japanese style.



Mantel-Piece in the Anglo-Japanese Style, by J. Hugh Goodman.

It is the design of J. Hugh Goodman. By inspection it will be seen that it is very simple in its individual parts, and yet the combination is such as to make a very showy article of it. Our details show horizontal sections taken at the different points indicated by the reference letters in the elevation. The following particulars furnished by the designer were published in the exchange referred to:

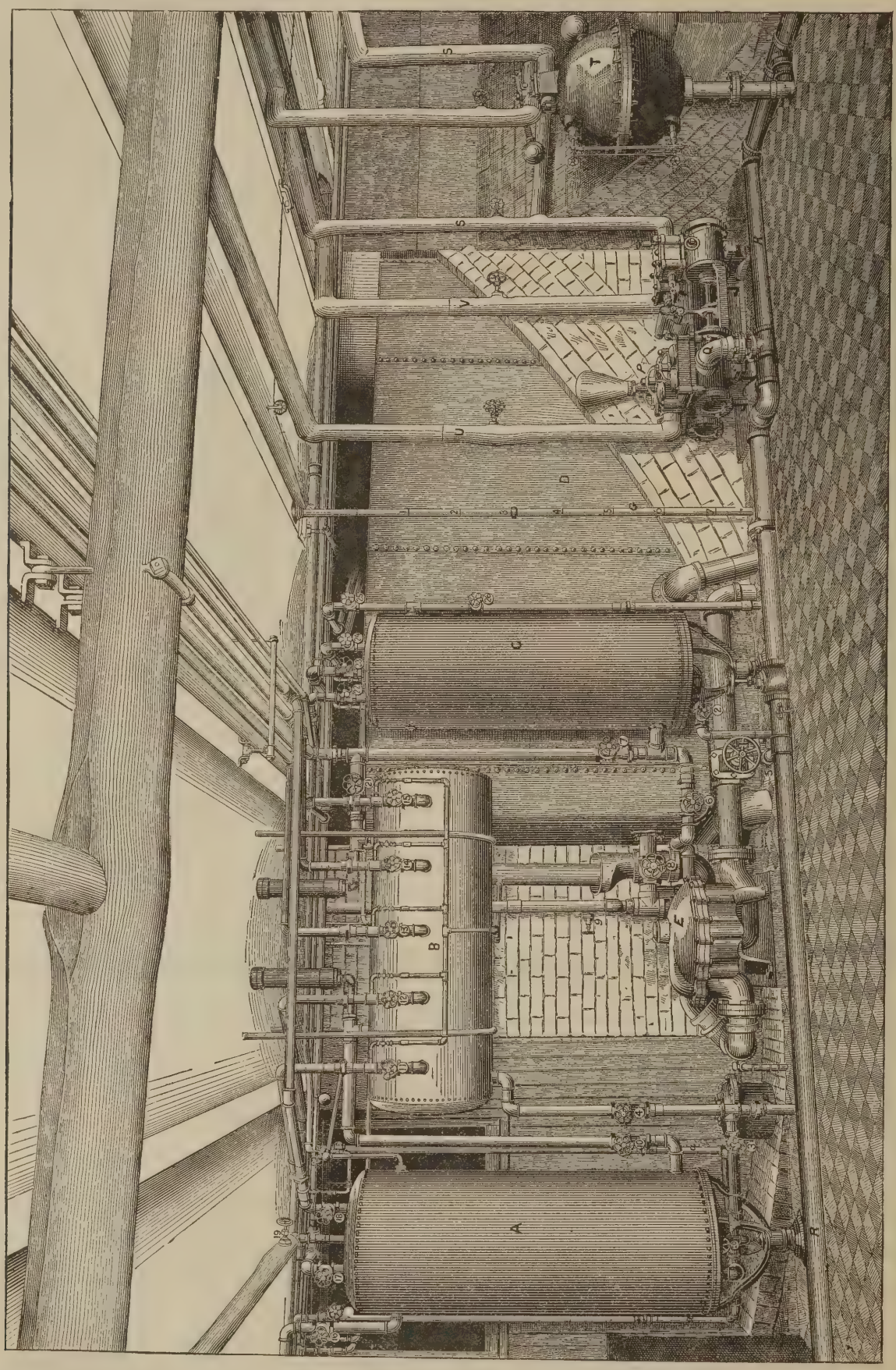
The principal parts of framing are of square section, with beaded angles, while the narrow moldings dividing up the various spaces are almost all of the same section. The framing around the grate is divided into panels of various sizes, uniformly arranged, those in the center being intended to contain the date, while at each side a small niche is shown. The mantel-shelf is carried on molded and perforated brackets, with curved and molded fascia between. In the center of the upper part is a looking glass; the edges are beveled, and it has a bold bead around it; on each side of it are two shelves, one square and the other of semicircular form, as shown, carried on beaded brackets which die into the framing and are of similar section to those below. Above the glass is a shelf, carried on a molded bracket, with a small cupboard on each side of it with plain paneled doors. These cupboards, the bottom of which forms a continuation of the shelf between them, are carried by the framing at the outer sides being brought solid with bold curves, the front and inner sides having plain curved brackets which stop against simple cut pendants. The shelf has a cove at the back, divided by narrow moldings, and stopped against a curved and beaded fascia.

The shelf at the top has a molded rail supported by horizontal and vertical bars, the angle ones being of larger section and molded. At each side of the framing beaded pieces are shown, cut to sweep; these, as are also the outer sides of cupboards, are relieved by slight sinkings. The base of the mantel-piece is of the same section as and miters with the skirting, and the principal moldings of chair-rail miter with the molding immediately above the tiles. The above is suitable for execution in cheap wood and might be lacquer painted, and considerable relief would be obtained by the panels being fitted with Lincrusta-Walton of suitable design and color.

The venerable Thomas U. Walter, of Philadelphia, who was architect of Girard College and of the United States Capitol extension, still vigorously pursues his profession and draws plans with minute attention to detail, but, it is said, has made no plans for his departure, though he now is 80 years old.

The Plumbing and Water Supply of the New York Cotton Exchange.

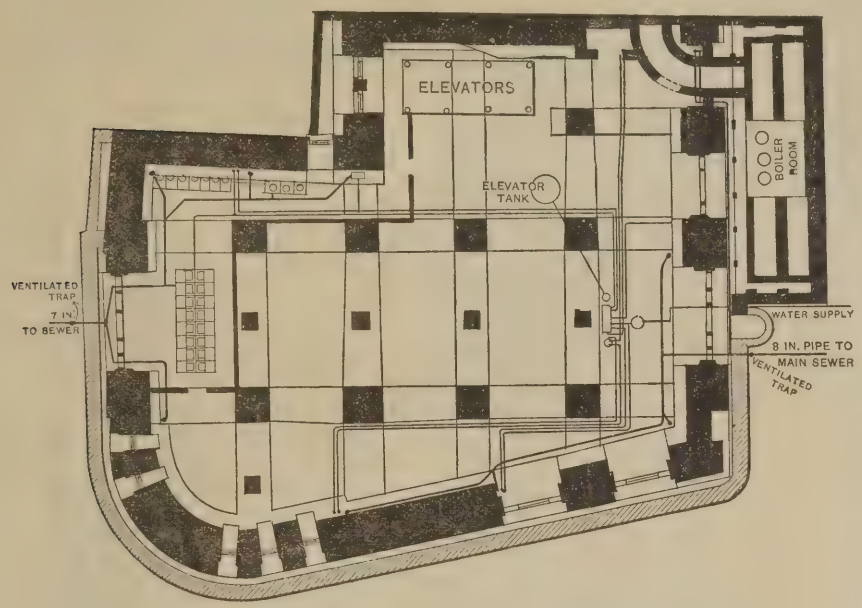
Some account of the plumbing in one of the most prominent office buildings recently built in New York will interest all who have



PLUMBING WORK IN THE NEW YORK COTTON EXCHANGE.—VIEW IN WATER-ROOM, ENGRAVED FROM A PHOTOGRAPH.

the planning or the execution of such work. The accompanying engravings afford the reader an idea of how the plumbing has been done in the Cotton Exchange Building. The building has six office stories, independent of the main floor and roof story, and is perhaps as complete in all its appointments as any similar structure in the city. It is steam-heated throughout, and presents to the inspection of the visitor a carefully-planned and well-executed system of plumbing and drainage. The building is located in that part of the city commonly known as Hanover Square. It is a handsome building and commands the attention of even the casual visitor to the city. The architect of the structure, which is claimed to be one of the most thoroughly fire-proof buildings in the city, is Mr. George B. Post. In giving our readers an idea of the plumbing of this building we shall do so somewhat upon the plan of taking them upon an excursion through its various parts, and pointing out the special features which seem to us likely to interest them. Our first visit must be to the basement, where are located the various receiving and distributing tanks for the supply of water, both hot and cold, and which are illustrated in the engraving on this page. This shows a view in what may be termed the water-room, which is located about midway of the building as it is entered from Hanover Square. Its position will be better understood by reference to the first of the plans on the next page, in which the tanks and the con-

necting system of pipes are indicated in outline. From this plan the general problem presented in this work will be understood. The water supply is from the Hanover Square front, while the discharge of sewage is in part to Hanover Square through an 8-inch pipe, and part through a 7-inch pipe passing through the wall of the opposite side of the building. These are indicated on the plan. Both are furnished with a running trap ventilated in the usual manner. Where



Basement Plan of New York Cotton Exchange, Showing General Plan of Pipes, Water Supply, Sewer Connections, &c.—Approximate Scale, 35 Feet to the Inch.

pipes are required to pass through walls a sleeve in the form of a piece of pipe of larger size is put in place, through which the smaller pipe is passed, thus making repairs and alterations, if any should ever be needed, a comparatively easy matter. Our second floor plan is that of the sixth office story. The several office floors are identical in arrangement, except in the matter of water-closets, shown on the plan. In the engravings we have indicated the course of the pipes to and from the various fixtures as well as can be done in drawings to so small a scale. The plumbing-work is so arranged that water may be used direct from the street mains in cases where the pressure is sufficient, or it can be taken from a tank located in the roof, and which is kept full by pumping, or the supply can be derived in part from each. Referring again to the view of the water-room represented by our large engraving, the various fixtures will be more readily comprehended by reference to the following index :

A—Hot-water tank.
B—Tank for distributing cold water under pressure derived from tank on roof.
C—Cold-water distributing tank under street pressure.
D—Receiving tank communicating with roof pump and the boilers in the boiler-room under sidewalk.
E—Crown water-meter.
F—Steam trap connected with the hot-water tank A.
G—Water indicator.
a a—Hot-water circulation pipes.

The gate-valves marked 1 to 26 in the illustration are intended to serve the following purposes :

1—Main stop-valve from street supply.
2—Sediment-valve from cold-water tank C.
3—Sediment-valve from hot-water tank A.
4—Sediment-valve from distributing tank B.
5—Sediment-valve from receiving tank D.
6—Supply-valve from street to tank C.
7—Intermediate valve, to be used only when it becomes necessary to supply the entire building from receiving tank D.
8—Large supply-valve to tank D.
9—Small supply-valve to tank D, controlled by ball-cock in tank.
10—Cold-water-supply valve to hot-water tank A.
11, 12, 13, 14 and 15—Control cold-water supply to fixtures in different parts of the building.
16, 17 and 18—Control hot-water supply from tank A to the fixtures on the various floors.
19—Steam-supply valve to hot-water tank A.
20—Return-valve to same.
21—Main stop-valve from elevated (roof) tank, controlling distributing tank B.
22, 23 and 24—Valves controlling cold-water supply from street pressure through tank C.
25—Valve controlling supply from receiving tank D to elevated (roof) tank.
26—Valve controlling water supply to boiler-room.

The water supply entering from the street main passes through the 4 inch crown meter (E) and the large supply-valve (8) to the receiving tank D, for general use above the first floor and for the boilers. Should any necessity arise which would call for increased facilities to keep this tank filled without unnecessary strain upon the meter, the small supply-valve (9) is utilized and the required supply secured. The water under the street pressure also enters through valve (6) to tank C, which provides a cold supply for all fixtures located on the basement and first floor, the street pressure being insufficient to force the water higher than the latter point. Through the means of a steam pump the water is raised from tank D to an elevated tank (10½ x 8 x 6 feet) located on the roof, from whence it is returned to tank B by a supply-pipe, to be subsequently distributed through all the rising lines above the first story. The hot-water tank A is also supplied from the roof tank, and through it hot water is furnished to all the fixtures needing it throughout the entire building, the basement included. The primary object of the receiving tank is to have a constant supply of water available for all necessary purposes. Under ordinary circumstances the basement and first floor are supplied through the medium of the ordinary street pressure and tank C, but should an emergency arise the receiving tank D can be kept rapidly filled, so as to keep up a roof supply, and by opening the intermediate valve (No. 7) the fixtures throughout the entire building can be supplied directly from the elevated tank on the roof. The "indicator," marked G, made of polished brass with engraved graduations, and a brass finger or ring operated by weights, with counterbalanced chain passing over pulley and attached to a copper float, is a reliable guide at all times to the actual depth of water in the tank. The steam boilers are also supplied from the receiving tank D.

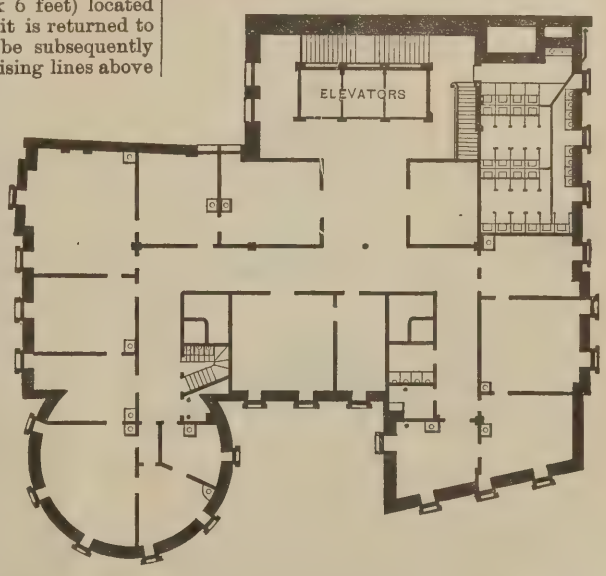
The various pipes represented in our illustration, leading from the respective tanks, are all of wrought iron, galvanized, with screw joints. Indeed, it may be stated that a distinctive feature of that part of the work which we are specially illustrating, viz., the water-room, is that it is all of iron, not a wiped joint forming any portion of it. To the different valves as represented small pet-cocks are attached for the purpose of emptying the pipes when necessary.

Passing from the water-room we come to where the basement water-closets, 16 in number, and urinals, seven in number, with three wash-basins and one slop-sink, are located. The closets are of the Hellyer pattern, and are grouped together, back to back, as shown in the diagram on the next page, in two parallel lines of eight closets in each line, every four of which are supplied from one cistern made of white-pine wood copper-lined, and supplied with service-box. The floor of the room is of slate, and the closets are left entirely open underneath. Each closet is separately vented in the usual manner from the crown of the trap, with vent-pipes running above the roof, and in addition there is a special ventilating-pipe, marked D on sectional view of closet, which is intended to ventilate the bowl of the closet while in use. This pipe is made of galvanized iron, and is carried up to a larger rectangular pipe which runs horizontally above the closets and between the cisterns, whence it is afterward carried up through the building to the roof. Referring to the sectional view, the following is a key to the reference letters :

A—Main sewer under floor.
B—Trap under closet.
C—Ventilating (or back-air) pipe.
D—Ventilating-pipe from closet-bowl when in use.
E—Cistern.
F—Service-box.

A feature in the ventilation of the traps of these closets is that the vent-pipes are carried up above the closet-bowls in order to prevent any possibility of their efficiency being lessened by the filling or overflowing of the closets from any cause whatever. The cisterns in use are not those usually supplied with the Hellyer closet, but were made specially to suit the circumstances of grouping so many together in a bunch. The pipes are uncovered and readily accessible.

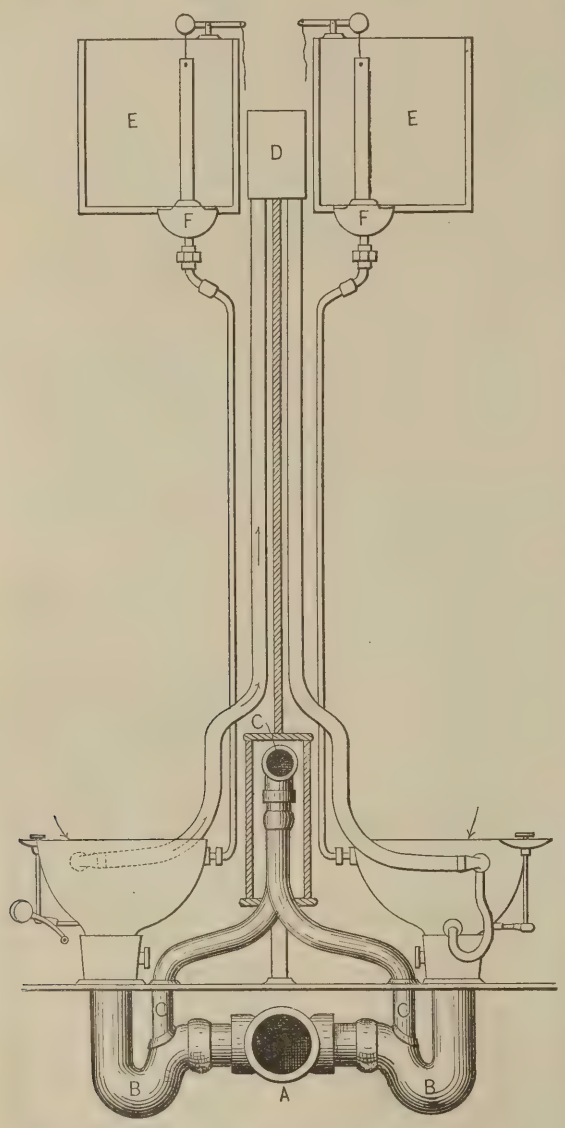
The urinals are put up with the same care as the water-closets. They are what are known as No. 1 Bedfordshire "flat back," and are supplied with a special ventilating-pipe similar in character to that in use in the water-closets. We give a sectional view which shows, among other peculiarities, a "step-trap" under platform and the means provided for cleansing it. The following key to the reference letters will make all parts easily understood :



Sixth Office Story Plan, New York Cotton Exchange, Showing Closets, Urinals and Basins in Rooms.—Approximate Scale, 35 Feet to the Inch.

A—Supply-pipe.
B—Ventilating (or back-air) pipe from trap.
C—Waste-pipe.
D—Step-trap.
E—Urinal-trap with brass shield.
F—Stop-cock through which to wash step-trap.
G—Ventilating duct from urinal.

The step-trap D is cleansed through the small pipe leading from the stop-cock F, which is operated solely by means of a key. The vitiated air arising from the use of the urinal enters the duct or pipe G through a small register or grating placed above the bowl, and is carried into the pipe marked D, on water-closet sectional view, to the outer air at top of building. The urinals are furnished with 2-inch traps having a brass shield set close up to fixtures and with the Tucker self-closing stop cock. The platforms are of 2-inch-thick Italian marble, and the backs and partitions are composed of polished Italian marble 1 inch thick. The number of urinals throughout the building, all of which are identical in detail and finish, is 7 in cellar, 4 on main floor, 4 in gallery, 8 in each of the first, second, third, fourth and fifth office stories and 15 in the sixth office story, making in all 70. The number of water-closets is 16 in basement, 1 for ladies' use on each of first, second, third, fourth and fifth office floors, 22 on the sixth office floor and 1 on roof for use of the janitor and the custodian, making a total of 44 in the building. The water supply for the people living in the roof story (janitor's family) is not derived from the large elevated tank already referred to, but is taken from a smaller one located at a proper altitude above the large tank in order to secure the required pressure. The rising lines of supply-pipes are in no case less than 1 inch in diameter, and are of galvanized wrought iron, the branches being of lead. The spring-cocks for basins and sinks, as well as the urinals, are self-closing Tucker's patent. In addition to the elevated tank for the house supply there is a tank capable of holding about 15,000 gallons on the roof for working a set of Otis hydraulic elevators.



Section Through Water-Closets, as Set Back to Back in New York Cotton Exchange.

Besides the arrangement of the hot and cold water tanks in the basement, which forms the important feature in our principal illustration, portions of the steam-fitting are also given, which call for some explanation at our hands. These are best indicated by the following references :

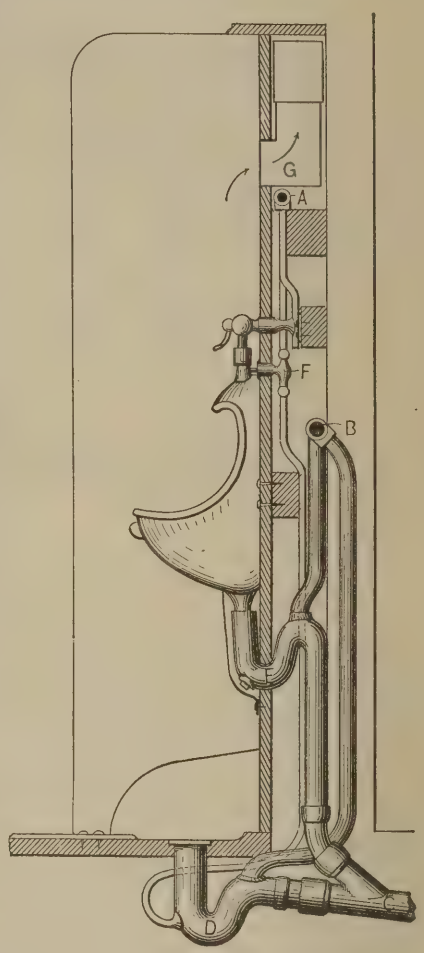
P—Duplex automatic steam-pump.
Q—Suction-pipe.
R—Return (condensation) pipe.
S—Steam-pipes.
T—Pump governor (Kiely).
U—Discharge-pipe to boiler.
V—Exhaust-pipe.

The system represented is that known as Kiely's patent water-line system, and has reference mainly to the method of disposing of the water produced by the steam condensed in the several radiators throughout the building. The return-pipe R collects and returns this water to the pump governor T, in which it rises until it reaches a certain point indicated on the gauge attached to it. The pressure caused by the water rising opens a valve in the steam-pipe S, which releases and directs a sufficient supply of steam for working the pump P, which is automatic and which draws off the water from the pump governor through the suction-pipe Q and sends it through the discharge-pipe U to the boiler. When the water is drawn off below a given point the valve in the steam-pipe closes, and, the supply of steam to the pump being shut off, the pumping ceases until the water again rises sufficiently in the governor to open the valve. In this manner, according as the water of condensation accumulates, it is automatically disposed of in a simple and effectual manner.

Of the plumbing fixtures used in this building the water-closets (the Hellyer), were furnished by the Meyer-Sniffin Co., and the urinals (the Bedfordshire) by Renton Bros., of East Ninth street. The cast-iron pipe was supplied by Cassidy & Adler, West Fifty-fifth street; the wrought-iron pipe and fittings by John Simmons, Centre street, and the lead pipe by the Leroy Shot and Lead Mfg. Co., Water street. The gate-valves, were furnished by the United Brass Co., 79 Fulton street. The plumbing-work was done by Mr. Thos. J. Byrne, of 253 Fourth avenue, under contract, and occupied about a year in its completion. The cost in round figures was about $25,000. The fitting up of the elevator system, with the exception of the tank, was done by the firm of Otis Brothers, and the steam heating contract was carried out by Baker, Smith & Co. In its finished condition, with all the accessories of artistic coloring, tiled floor and harmonious surroundings, the water-room shown in the large engraving presents a very attractive appearance.

Waste Material in Building Construction.

The utilization of waste material in building construction, instances of which are occasionally encountered, are strikingly illustrated by the employment of coal slack which prevails in certain parts of Europe. The first steps in the direction of using coal for building purposes were due to the initiative of certain Lyons builders who wished to find a cheap, durable and healthy material for the construction of suburban houses upon sites acquired for comparatively short leases, the contingency of occasional partial inundations being also kept in view. The coal slack was mixed with some slack lime, and was treated as a concrete. The mass hardened rapidly, and even after a few days the walls were firm enough to support the joist framings. After the lapse of a month the building was dry. At the time named coal slack was so plentiful that it could almost be had for the asking. After 30 years' experience this mode of construction has become so general in Lyons that the necessary transport of coal slack from a certain distance has raised the cost to about 3d. per cubic foot. According to the *Wochenschrift* of the Austrian Architects' and Engineers' Association, the original proportion for mixing was four parts of slack to one part of lime. At first fat lime was used, and later on hydraulic lime, but in order to obtain greater strength it is recommended to increase the proportion of lime and to use white lime. The ramming is best effected in layers 6 inches thick. The walls are usually made 20 inches thick, but may be thinner if the burden they have to support be light. Solid party walls can be made 6 to 8 inches in thickness by ramming the mixture between boards, or by converting it into bricks, which can be built into a wall after drying. For a long time this style of work was confined to buildings of an unimportant character, but within the last two years it has been used by various architects for public buildings and private houses of large size. The strength and fire-resisting properties of the composition in question have been successfully demonstrated by M. Louvier in the course of experiments made by him on a large scale. It is further recorded that a nitro-benzine factory near Lyons was burned down, the violence of the conflagration even melting part of the machinery. The walls, made of this slack mixture, were unconsumed, their surface having a glazed appearance, and sustained without repair the ceiling and roof of the restored building. Similar results are said to have been demonstrated by the burning of the Célestins Theater, at Lyons.



Urinal in New York Cotton Exchang

CORRESPONDENCE.

Miters and Bevels.

From H. A. P., *Elmira, N. Y.*—I inclose a rule for finding different bevels and miters, together with sketch illustrating the same. I have used this rule for a long while, and finding it useful send it to *Carpentry and Building*, hoping that through that valuable medium it may be brought to the attention of many who have use for such a rule. Referring to the diagram, let A B C D represent the elevation of a box, the sides of which have a slope of 45°. Take C as a center and C B as

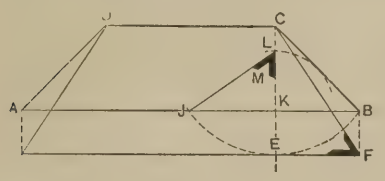
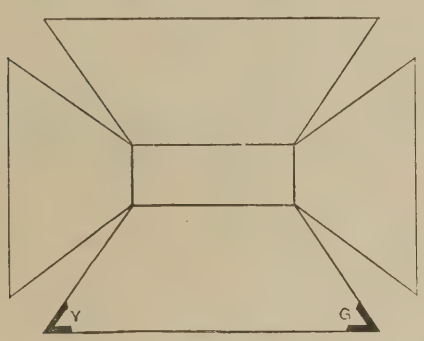


Diagram of Hopper Bevels Submitted by H. A. P.

radius and describe a semicircle under the line A B, as shown by B E J. From C let fall a perpendicular through the line A B, intersecting the semicircle in the point E. Through the point E thus established draw a horizontal line or a line parallel to A B, making it in length equal to A B. From the points F thus established draw F C. Then the bevel at F will be the bevel to be used for the sides of the box or hopper. To find the bevel of miters at the corners with K as center and radius equal to the distance from K to the line C B, describe an arc cutting the line K C, thus establishing the point L. From L draw the line L J, cutting the line A B at the point J, which represents the intersection of the arc first drawn with the line A B. Then the bevel at L is the bevel



Application of the Bevels.

of the miters at the corners. The second drawing shows the sides of the box laid out flat.

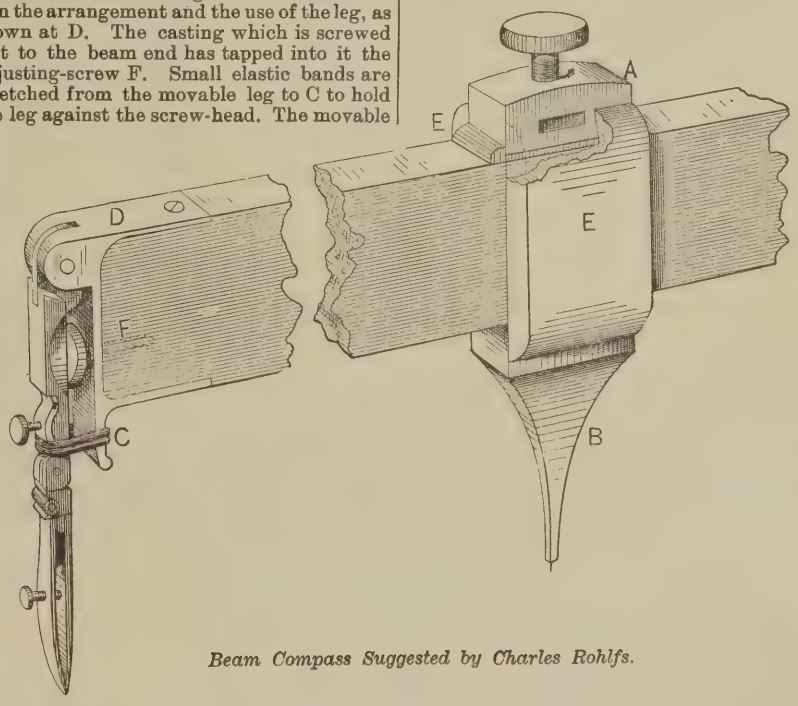
Fire-Proof Shingles.

From W. C. V., *Schenectady, N. Y.*—Can you give, through *Carpentry and Building*, a receipt for a paint for shingle roofs which will make them somewhat fire-proof?

Answer.—One of the simplest methods of accomplishing that which our correspondent has in mind is the use of whitewash. Wood can be rendered practically fire-proof by first drying it thoroughly and then coating it with common whitewash. The coat of whitewash shells off, but it is still a difficult matter to burn wood which has been coated with whiting or even limewash. A mixture of borax and sulphate of magnesia is also recommended. To prepare this, use 3 pounds of borax and 2½ pounds of sulphate of magnesia, with 20 pounds of water. The action of this mixture depends on the formation of a borate of magnesia insoluble in water, hot or cold, which surrounds and impregnates the fibers of the wood, and thus renders the development of the combustible gases and the spread of flame very difficult. A mixture of sulphate of ammonium and sulphate of lime or gypsum is also applied. The action of this mixture depends on an incrustation of fibers which prevents the spreading of fire, and, on the other hand, extinguishes flames by the volatilization of the salt of ammonium at a high temperature. Take 1 pound of liquid ammonia and 2 pounds of sulphate of lime. A single coat of this concentrated solution is sufficient. The wood is not rendered absolutely incombustible, but is not easy to light, and ceases to burn when the action of foreign inflammable substances comes to an end.

Beam Compass.

From CHARLES ROHLFS, *Brooklyn, N. Y.*—I inclose a sketch showing a construction of beam compass that I have found very useful. In my work, which is that of draftsman and pattern-maker, I have found it necessary to use a beam compass of speedy, fine and safe adjustment. To meet these requirements I originated the idea here illustrated. The device shown does the work of instruments which sell from $8.50 to $12 each. This point alone will prove its value to beginners, as its total cost need not exceed $1.50. It has the recommendations of the better class and higher priced tools, namely, needle-point, pen and pencil points and nice and safe adjustment. The pen and pencil end are fixed to the end of the beam. You amputate the business end of a pair of compasses and have a hinge-screw fitted to retain the arrangement and the use of the leg, as shown at D. The casting which is screwed fast to the beam end has tapped into it the adjusting-screw F. Small elastic bands are stretched from the movable leg to C to hold the leg against the screw-head. The movable



Beam Compass Suggested by Charles Rohlfs.

head with fixed needle-point is made of wood, in four pieces. Before gluing them together the nut for the set-screw is let into the piece A. This screw may be made using a ⅛-inch stove-bolt and filing the head off to admit of its being tapped into a piece of wood, afterward shaped as shown. The piece B has a needle driven into it and is then tapered, as shown. I use a maple-wood beam ¼ inch thick and 1⅛ inches wide. With it I am able to sweep a circle 9 feet in diameter with accuracy, making a solid ink or pencil line, as may be desired.

Building Association Problems.

From R. D. C., *Owasso, Mich.*—Referring to the problem presented by "L. F. U." in the June number, I would say that if the borrower pays one-twentieth of the $1000 at the end of the first month, and $10 additional, then $10 is the interest for the month. Now, to find the rate of interest when principal, time and interest are given, the rule is to divide the given interest by the interest of the principal for the given time at 1 per cent. The interest in this case is $10. The principal is $1000 and the time is one month. The interest on $1000 for one month is $\frac{10}{12}$. Dividing this by 10 we have as a result $\frac{1}{12}$, or 12 per cent. per annum, or 1 per cent. per month. The next month he pays $10 on $950, and the succeeding month $10 on $900, and so on, paying the interest on each decreased principal until the fifth month, where $10 on $800 gives 1¼ per cent. per month. By similar calculation I find that on the 11th month he pays 2 per cent. per month, on the 16th month 4 per cent. per month, on the 17th month 5 per cent. per month, on the 19th month 10 per cent. per month, and on the 20th month 20 per cent. per month. This makes an average monthly rate of 3.6 per cent. per month.

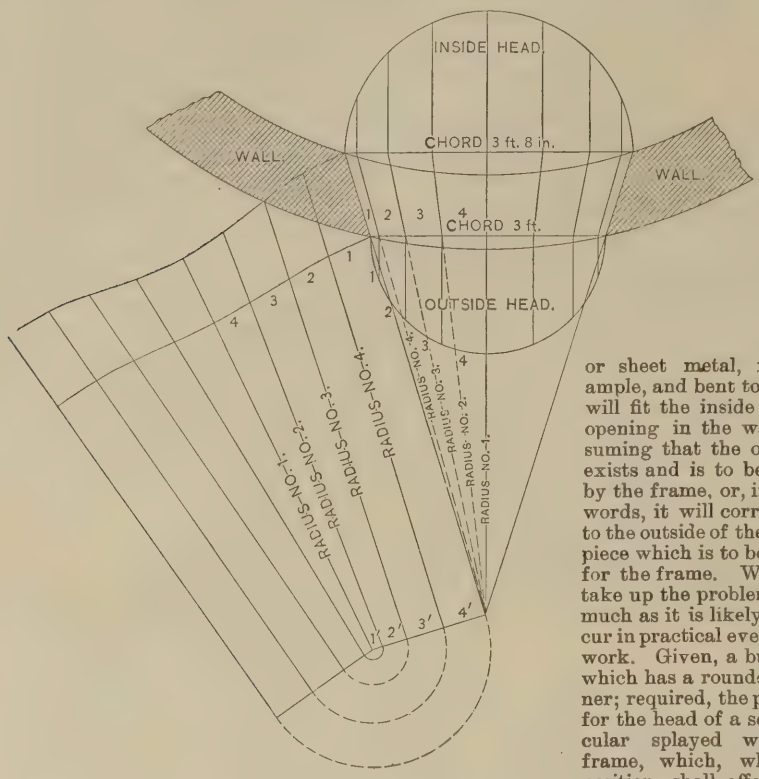
Note.—Building association problems, from the very nature of the case, are somewhat intricate, and it is seldom that two persons, even though tolerably well acquainted with the workings of these commendable institutions and familiar with the principle upon which their successful operation depends, will agree in methods of calculation, even though they do not differ in results obtained. So far as we have published replies to the question submitted by a correspondent in our June number they amply illustrate what we have above asserted. This correspondent presents an ingenious method of reaching a conclusion, and one which would be readily followed by those who are not accustomed to complex methods of calculation. We fear, however, that he is not altogether clear in explaining the method, or else has made a mistake in some of his steps. We lay his letter before our readers, and have no doubt that it will afford some of them the occasion of further communications relating to this subject.

Imitating Rosewood.

Several correspondents have inquired of us for receipts for imitating rosewood, walnut and other varieties. Various methods have been devised for treating the surface of certain woods so as to produce imitations of choicer varieties. Some of the most attractive work in this line, however, is effected by simply spreading on the surface of the material a concentrated solution of hypermanganate of potassa, this being allowed to act until the desired shade is obtained. Five minutes suffice ordinarily to give a deep color, a few trials indicating the proper proportions. The hypermanganate of potassa is decomposed by the vegetable fiber with the precipitation of brown peroxide of manganese, which the influence of the potassa, at the same time set free, fixes in a durable manner on the fibers. When the action is terminated the wood is carefully washed with water, dried, and then oiled and polished in the usual manner. The effect produced by this process in several woods is really remarkable. On the cherry, especially, it develops a beautiful red color which resists well the action of air and light, and on other woods it has a very pleasing and natural effect.

Splayed Jambs.

From J. D. W., *Passaic, N. J.*—I noticed your note upon a letter from "J. V. H. S.," of New York, on "Splayed Jambs." This caused me to give some attention to the problem, which, I find, was proposed by "J. R. L.," of Chillicothe, Mo. In his question this correspondent says that the head is to have the same splay as the jambs. Inclosed I submit an approximation to the true lines as nearly as can be got by spacing off a circle on a plain surface. The spaces having similar figures are transferred, as shown, to the developed drawing. In other words, similar figures in the different parts refer to the same thing. As to bending the head, the usual plan is to be employed. Draw a semicircle with radius equal to that of the pattern, using a rod the thickness of the head stuff. Cut a kerf opposite the center from which the semicircle is struck, fasten the lower end of the rod and then bend until the cut is closed. Notice the distance on the circle traversed by the end of the rod on account of bending, as described. This distance, marked on the circle, will give the distance between the kerfs to be made in the pattern. These are to be cut in the same direction as the lines marked "radius No. 1," &c.



Splayed Jambs.—Fig. 1.—Diagram Accompanying Letter From J. D. W.

Note.—The accompanying engraving, Fig. 1, has been made from our correspondent's sketch, which was sent in connection with the above letter. After we had engraved it, and after we had prepared some remarks intended to show the fallacy of the method and the erroneous result reached, we received a second letter from him containing a modification of the plan and acknowledging that the first was in error. His second letter reads as follows: "My diagram is wrong. If one of the semicircles had been a semi-ellipse it would have given a pattern that would have been level at the key of the arch, and intersecting and joining the splay at the sides." Accompanying this we received some paper models representing our correspondent's second attempt at the problem.

Without occupying space to show the fallacy of the method which this correspondent explains, and which is still wrong with the modification, we will attempt to throw some light on the nature of the problem by a demonstration of our own, which possibly will approach the subject from a different direction than would ordinarily occur to those who have worked in wood exclusively and whose knowledge of geometrical lines is combined with calculations for thickness, allowances for joints, &c. We will consider the shape alone, without regard to the thickness of the material to be used, and will develop a pattern which, if cut in pasteboard or sheet metal, for example, and bent to shape, will fit the inside of the opening in the wall, assuming that the opening exists and is to be fitted by the frame, or, in other words, it will correspond to the outside of the headpiece which is to be made for the frame. We shall take up the problem very much as it is likely to occur in practical every-day work. Given, a building which has a rounded corner; required, the pattern for the head of a semicircular splayed window-frame, which, when in position, shall afford the same general appearance as similar windows in the straight walls of the building. In Fig. 2 of the engravings is shown a horizontal section or plan view and elevation of one of the windows in the straight wall. In Fig. 3 we show the same parts in the curved wall. The first step to be taken is that of determining the splay of the jamb or frame in the curved part. Several different courses are open to us, and different results will be obtained by each. What we desire to accomplish is such an angle for the splay as will give the same general appearance to this frame as is shown by the others, or, in other words, to have a correspondence and appropriate relationship between the frames in the straight and curved parts of the wall. What we have really done, without stopping to explain in detail, is to fix the angle of the splay arbitrarily or by inspection rather than by any rule.

We will assume that the inside line of the splayed head shall be a semicircle. From the conditions of the problem, one or the other, or possibly both, of the lines of the head will be other than a semicircle, and therefore we elect, choosing that which will best meet the general conditions we have described, namely, symmetrical appearance. What we have next to do, then, is to develop the outer curve. In doing this we construct the diagram shown at the left in Fig. 3. We lay off horizontally A 6, equal in length to the curved line 1 C of the plan, thus making the straight line equal to the stretchout of half of the curve of the plan. The distance A 1 vertically is made the same as X G of Fig. 2 and the same distance X G is set off as the hight of the proposed arch in the elevation in Fig. 3. Having, then, the hight and the run, the required curve, which by the conditions of the problem is the quarter of an ellipse, is drawn by any means that will produce a true ellipse. Having this curve, we step it off into any convenient number of spaces, in this case 5, as indicated by the small figures. From the points in the curve thus established we drop lines parallel to 1 A, cutting the base line A 6, as shown. We then transfer the distances in A 6 to the line 1 C of the plan, thus establishing in it the points indicated by 1, 2, 3, &c. From these points we carry lines vertically, producing them indefinitely. Also from the points in the development of the outer curve, at the left, already referred to, we carry points to the right, intersecting those derived from the plan, thus establishing the points 1, 2, 3, 4, &c., in the elevation. Through these points the curve 6 G is traced. We shall require the same divisions in the inner curve of the head, which we have already described as being a semicircle, as we have established in the outer curve, and therefore, for the purpose of dividing the inner curve, we carry lines in the direction of the center X, marking on the inner curve when they cross, thus establishing the points 8, 9, 10, &c., in it. From these points we drop lines on to the corresponding curve of the plan, establishing there the points 7, 8, 9, &c. For the development of the inner curve we construct the diagram shown at the right in Fig. 3. On the horizontal line we lay off a straight length, equal to A 7 of the plan, transferring it point by point. From the points thus established in the base we carry lines vertically, extending them indefinitely, as shown, and then from the points in the inner curve of the elevation we carry lines horizontally to the right, intersecting the vertical lines just mentioned, and through the points thus established we trace the curve as shown.

The scheme upon which we are working to develop the pattern of the required head may be described as that of triangulation. The shape of the head is irregular, and the best that can be done in developing a pattern for it is to obtain points in its boundaries, and then trace a line through the same. Having a set of points in the inner and outer lines of the elevation, and corresponding points in the inner and outer lines of the plan, we have it within our power to construct a series of triangles the hypothenuses of which will afford us lengths equal

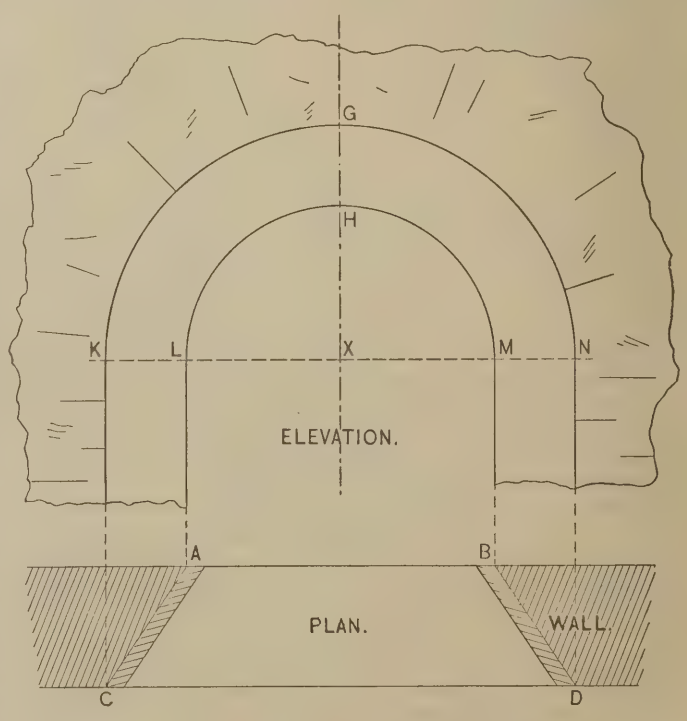
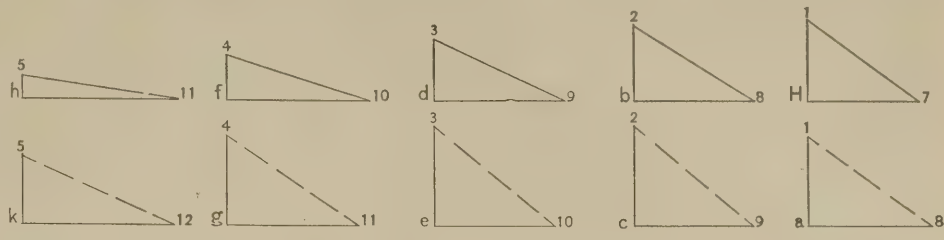


Fig. 2.—Elevation and Plan of Splayed Window in Straight Wall.

to those obtained by measurements on the splayed surface in directions indicated by the lines in elevation and plan. With these lengths and the spaces on both inner and outer curves corresponding to the other sides of triangles, we shall be able to obtain points in the outline of the pattern through which its boundary may be traced.

In the elevation we connect points 1 and 7, 2 and 8, 3 and 9, 4 and 10, 5 and 11, and 6 and 12. We likewise connect 1 and 8, 2 and 9, 3 and 10, 4 and 11, and 5 and 12. In the same manner we connect corresponding points in the inner and outer lines of the plan, thereby dividing our splayed surface into a series of triangles the sides of which may be accurately measured by the means already described in connection with the triangles shown in Fig. 4, which we now proceed to construct. Of the first triangle—the one at the upper right-hand corner—the hight would be 1 H of the elevation, while the run or base would be 1 7 of the plan. We set off the hight 1 H, and at right angles to it the distance H 7, equal to 1 7 of the plan, and draw the hypothenuse. The hypothenuse 1 7 of this triangle represents the actual distance between the points 1 and 7 in the elevation or plan. In like manner the hypothenuse of the second triangle in the upper row in Fig. 4 shows the actual distance between the points 2 and 8 of the elevation. The vertical hight of 2 over 8 in this case would be equal to 2 *b* of Fig. 3, the point *b* being derived from 8, as shown. Accordingly, we set off in Fig. 4 in the second triangle, already referred to, a hight equal to 2 *b*. We lay off the base *b* 8, equal to 2 8 in the plan, and then connect the points, the resulting hypothenuse, 2 8, being the width of the required pattern corresponding to the line 2 8 of the plan. In the same manner we construct the other three triangles in the upper portion of Fig. 4, each of the triangles representing a vertical section through the head on the line of corresponding numbers in the plan. The triangle shown in the lower portion of this figure correspond to similar sections taken on the dotted lines in the plan. The first triangle corresponds to 1 8 of the plan. The run is equal to this distance, which is set off in the triangle, as indicated by *a* 8. The hight would be equal to 1 *a* of the elevation, the point *a* being derived from 8, as indicated in the engraving. This hight being established in the triangle, the hypothenuse 1 8 is drawn, which corresponds to the actual distance between the points 1 and 8 of the plan or elevation. The hypothenuse of the second triangle in the lower row in like manner corresponds to the actual distance from 2 to 9, and so on for the others.

Having thus obtained the correct dimensions of the triangles which form the pattern, we have only to construct the triangles in the rotation in which they occur in the elevation to produce the required pattern. The triangles shown in Fig. 4, as described, give the width of the pattern across its face between certain points. The spaces in the developments of the inner and outer curves of the frame, shown at the right and left of Fig. 3 respectively, give the distances between these points on the inner and outer edges of the pattern. With all these dimensions established, the problem is that of constructing a triangle where the length of the several sides is known, or, rather, a series of triangles, having sides in common.



Splayed Jambs.—Fig. 4.—Triangles Constructed from Measurements Derived from Elevation and Plan, the Hypothenuses of Which Represent the Width of the Splayed Head at Different Points.

At any convenient point, as in Fig. 5, we draw 1 7, being the center line of the pattern, making it equal to 1 7, the hypothenuse of the upper right-hand triangle in Fig. 4. From 7 as center, with 7 8 of the development of the inner curve as radius, we strike a small arc as shown at 8 in the pattern. From 1 as center, with 1 8 of the first triangle in the second row of Fig. 4 as radius, we intersect the arc last struck, thus establishing the point 8. From 1 as center, with radius equal to 1 2 of the development of the outer curve, we strike a small arc, as shown at 2. Then from 8 as center, with 8 to 2 of the second triangle in the upper row of Fig. 4 as radius, we intersect the arc at 2 already drawn, thus definitely establishing the point 2 in the upper line of the pattern. We continue in this way, using the hypothenuses of the several triangles as shown for measurements across the pattern, and the spaces of the inner and outer curves as developed in Fig. 3 for distances along the edges of the pattern, establishing the several points as shown. We connect 6 and 12 by a straight line, and through the intermediate points trace free-hand, or by bending a strip of wood, the curve, as shown. The resulting pattern speaks for itself.

The accuracy of the method we have explained depends upon the care with which the measurements are taken and the general fineness of the drawings. The points established in the curves of the head which determine the proportions of the triangles must not be too far apart.

So far this problem, both by our correspondents and by ourselves, has been considered upon the idea of kerfing a board or plank and bending it to shape. This construction is not always followed in such cases. We know that many of our readers are not in favor of kerfing upon general principles, and therefore they will be glad to see methods explained of producing this out of solid material. We shall be glad to have our readers consider this phase of the problem and write us. The subject is not yet exhausted.

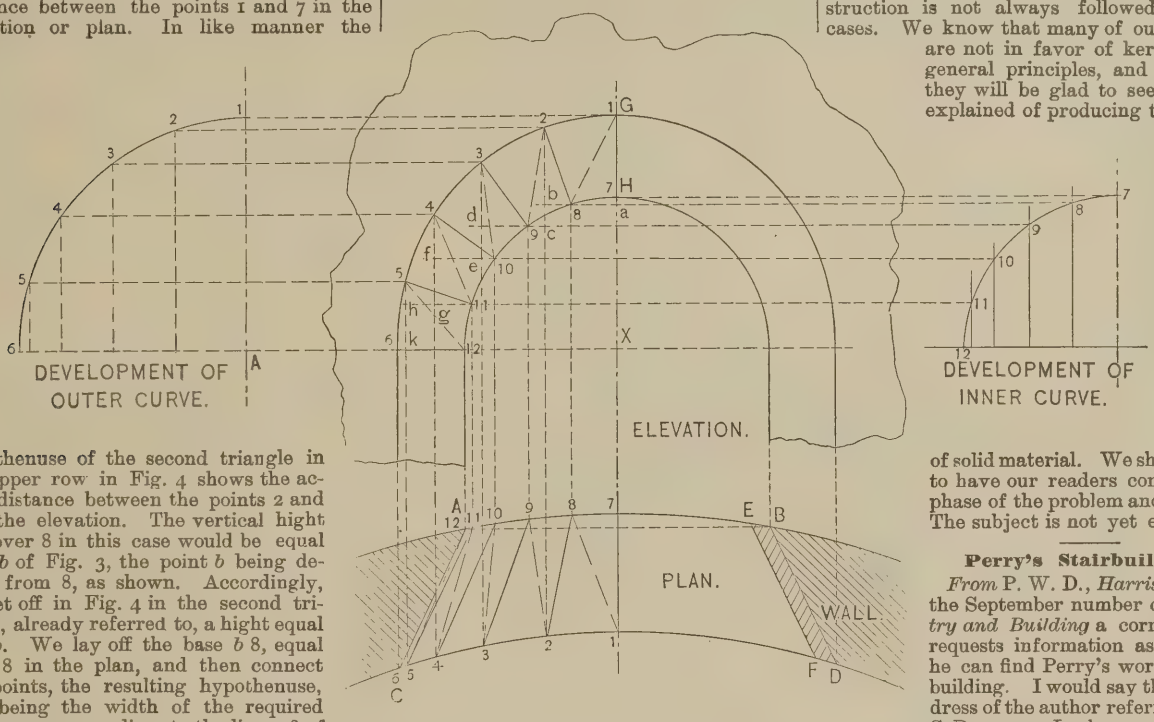


Fig. 3.—Elevation, Plan and Development of Curves of Splayed Window in Circular Wall.

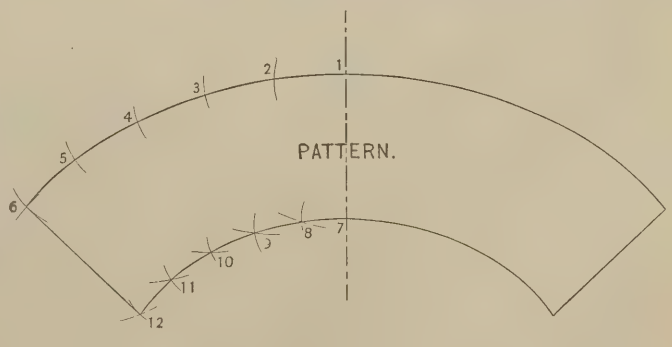


Fig. 5.—Shape of the Head.

Perry's Stairbuilding.

From P. W. D., *Harrisburg.*—In the September number of *Carpentry and Building* a correspondent requests information as to where he can find Perry's work on stairbuilding. I would say that the address of the author referred to is R. S. Perry, 521 Lackawanna avenue, Scranton, Pa. I offer as my opinion in the matter of the tangent system of hand-railing that it is the only correct system by which curves, easements, bevels and joints can be produced. Irrespective of what "W. H. C.," of Orillia, Ont., may say to the contrary, every piece of a rail must be a part of the circle over which it passes. Every part of a circle has its tangents. The great secret of hand railing is to know how to use the tangent lines so as to unite the straight rail and elevated portions by proper easements.

Painting Tin Roofs.

From E. & R., *Lamar, Mo.*—Kindly inform me, through the columns of *Carpentry and Building*, what kind of paint is most durable and lasting for outside tinwork. The metallic paint so much used seems to last but a short time in this country. We would like to know if there is anything made that is considered better. What is your opinion of red lead and boiled linseed oil?

Answer.—The painting of outside metal-work is a question of no small importance to all who have anything to do with metal-work of any kind. The painting of a tin roof, of a cornice or of a smoke-stack made of black iron are in some respects identical, and the requirements do not differ materially from those to be observed in painting structural iron work, such as cast iron, &c. The question is one that has had considerable attention at the hands of chemists and engineers, and upon which well-defined conclusions have been reached. Theoretically that paint is best which has the best body of oil with the smallest amount of pigment. The so-called metallic paints are largely employed because they are cheap, and this cheapness results from the fact that the smallest quantity of oil will carry the largest amount of pigment or iron oxide, which is the basis in this case. The oil is the protecting element, and the pigment is necessary only to give body to the paint. We are favorably disposed to red lead and oil, although boiled oil as commonly sold in the market is somewhat thicker than is desirable to employ. In "Painting and Painting Materials," by Condit Scheller, we find the following: "The value of a paint is its oil, and economy consists in purchasing good oil—the best and purest to be obtained. Adulterations should be advantageous in some cases, but it should be done for a purpose. On roofs, 15 to 20 per cent. of fish oil will be an advantage, and on bridges, which are not so frequently repainted, probably a little cotton-seed oil will do no injury. The principle of adulteration is very simple; the more 'elastic' the first coat the more durable, but the greater tendency to crack the second coat. The weather coat should always be the more 'elastic' (containing more not-drying oil), but a man of judgment will discriminate. The most elastic (in the true sense) of all oils is boiled oil, but it is too thick and needs to be thinned with raw oil or with turpentine. A priming of such oil thoroughly dried will stick if red lead be added, and if not put on too thick. A little boiled oil thoroughly mixed with raw oil increases its elasticity, but probably increases the chances that the paint will wrinkle, pit and crawl a little, although if care be taken in the mixing and using any such effect should be so small as to be imperceptible. There is this strong reason for using more or less boiled oil, that the pigment, at least lead pigment, will more thoroughly unite with and harden the oil, as boiled oil is partly composed of free linseed-oil acid, and we shall thus get more hard soap. At the same time we thus get a harder oil. We always get with the boiled a certain quantity of oil rubber produced by the boiling, and which, so long as it remains, gives the oil a rubber-like elasticity."

As bearing upon this same point the following extract from an article published in the *Painter's Magazine*, some time since, will be of interest: "The point of prime importance is the actual condition of the surface when ready to receive the first coat. Upon this point rests the success or non-success of subsequent applications, for if not in proper condition no paint will prove permanently preservative. Now, the best state is that where there has been formed upon the surface of the iron a film of black oxide which has been, while hot, thoroughly permeated by and incorporated with a resinous or tarry covering. This covering insures perfect success, and its thickness may be increased from time to time by additional coats of paint. If, however, a layer of hydrated oxide (ordinary rust) be once allowed to form, the successive coats of paint will fall off, their separation from the iron being merely a question of time. During the time, also, the rust has been spreading under the paint. An instance of this may be seen after outdoor riveted work has been in place for some time. Usually all the riveting is done before the final painting is begun, each rivet-head, in the meantime, being exposed to a damp atmosphere; the paint begins to peel off the rivet-heads long before it leaves the adjacent plates, and when this occurs nothing but thorough scraping will give the paint a chance to adhere again. So slight are the differences of manipulation which determine whether a given piece of work shall or shall not rust away that they may all be found in the different methods of manufacture pursued now and formerly. Taking the case of a piece of ornamental ironwork, which in so many instances has come down to us in unimpaired beauty and condition, it would now probably be forged in detail in one part of a factory, drilled, filed and fitted in another, and, when completely finished, be painted in three coats of best oil paint. Formerly the smith who forged the work punched the necessary holes at the same time, fitted his various pieces together as he went on, completing each piece as he proceeded, doing all the work with his hammer, and, to quote an old book of directions to good smiths, brushing his work over with linseed oil and suspending it for some time over a strongly smoking work fire. This will give at once a sort of elastic enamel coat, perfectly adherent and calculated to preserve the iron to the utmost Of course ironwork to-day is not made to undergo any such preparatory process, and the consequence is that we find it very difficult to produce good results in painting on iron surfaces. But it is pretty well established that the very best finish coat for iron is found in red lead, upon which any desired shade of lead paint may be placed with the best possible results."

Carpenters' Tool Baskets.

From G. O. G., *Lynn, Mass.*—In reply to the inquiry of "B. & B.," San Francisco, Cal., in the October number of *Carpentry and Building*, I would say that, while I am not acquainted with the manufacturers of the article referred to, I know that the goods in question are supplied by Charles A. Strelmyer & Co., 86 Woodward avenue, Detroit, Mich. Four sizes are supplied, known by Nos. 1, 2, 3 and 4, and also described as small, medium, large and large cloth-lined.

Note.—The same information has reached us from other correspondents. We have corresponded with Messrs. Strelmyer & Co., and have the following information, which is likely to be of interest to our readers: "The baskets referred to are made in England, or, to be more exact, the material from which they are manufactured is obtained in Sicily, and they are finished and bound in England. They weigh from 1 to 2 pounds, according to size, and are considered by those who have used them as unequaled in points of convenience and portability." The firm above named import the goods, keeping a stock on hand. They inform us they will be glad to quote prices to all who may write them.

Preventing Frost on Show-Windows.

From J. K. C., *Galt, Ont.*—Will you kindly advise me of the best way to keep show-windows from sweating and freezing up in cold weather? I have an excellent window, but on very cold days it is covered with frost. It is important to me that the windows should be kept clear of frost.

Answer.—Several plans have been suggested for overcoming the difficulty to which our correspondent refers. Some of these are based upon the theory that if the temperature of the air on the inside is the same as on the outside no condensation will occur. These conditions are obtained in several different ways. The principal feature of all of them, however, are plans of ventilation by which a thorough changing of the air is insured. We have seen show-windows kept free from frost by the use of an inner sash, placed back of the platform and separating the show-window from the store. This accomplishes the end sought, but in some cases the difficulty is repeated on the inner glass. This in most instances, however, is less objectionable, unless there is a desire for light through the show-window into the storeroom, or the ability to look through the two walls of glass to the street. A plan that has been suggested by the Utica Steam Gauge Co, and which is covered by a patent, if we mistake not, is that of obtaining an ascending column of warm air directly inside of the glass, so as to take up all moisture and keep the glass free from frost. For this purpose steam-pipes are arranged under the floor of the show-window, while air is taken in through a grating below the glass directly from the front of the building, or from some other point. The air, after being warmed by contact with the steam-pipes, is discharged through a narrow orifice directly inside of the glass. Still other methods, differing more or less in detail from those we have described, are in use, and perhaps some of our practical readers who have had experience in this direction will be willing to give particulars for the benefit of this correspondent.

Tarred Felt Under Tin Roofs.

From R., *Glencoe, Ont.*—Please inform me, through *Carpentry and Building*, if tarred felt paper has any injurious effect on tin plate or Canada plate when laid under the plate for roofing purposes.

Answer.—We have heard many complaints of tin rusting out very rapidly when laid over tarred felt, and also when painted with coal-tar products on the upper surface. From the best experience of the trade we are disposed to advise against laying tin over tarred felt. Inasmuch as the presence of the tar is primarily for the purpose of protecting the felt against the elements, and as it is thoroughly protected from moisture by the covering of tin we do not see any particular reason for using tarred felt in such places, instead of other material of a similar character which is not open to the objections above named.

Backing Rafters.

From J. D. W., *Paterson, N. J.*—There are more backed rafters in the books than in building. In my estimation it does not pay to back rafters. All that is necessary is to cut so that the arises will line with the rafters, or, in the case of a valley, get the center right.

Strength of Timber.

From H. W. E., *Collinsville, Ill.*—Will some of the readers of *Carpentry and Building* be so kind as to furnish rules for finding the strength of timber when applied in two positions—for example, vertical and horizontal, both flat and edgewise?

Note.—Referring this question to our readers, we fear, would scarcely obtain such answers as our correspondent desires. A book that we noticed among new publications a short time since, entitled "The Architect's and Builder's Pocket Book," by F. E. Kidder, contains chapters on the "Strength of Beams," "Stiffness and Deflection of Beams," and also upon correlated topics, the whole making one of the most satisfactory treatises upon the general question our correspondent raises that has yet appeared. He will probably serve his own interests by procuring a copy of the book mentioned and studying it carefully. A newspaper article, however comprehensive, would hardly meet the case.

REFERRED TO OUR READERS.

Limekiln.

From A. L., *Richmond, Va.*—I desire to obtain a description, and, if possible, drawings, of the most approved construction of a kiln for burning lime, arranged for either wood or coal, or both. If some practical reader of *Carpentry and Building* can furnish this information he will confer a favor.

Sheep Barn.

From W. G., *Pattonville, Mo.*—Will some reader of *Carpentry and Building* kindly furnish a plan for a sheep barn? A building is wanted with capacity for 100 sheep, and one which can also be used for cattle when desired.

NOVELTIES.

Forstner Auger-Bit.

Some time ago (July, 1883) we illustrated the Forstner Auger-Bit, describing it as one of the curiosities among the small tools available in the wood-working trades, both on account of its construction and the work it produces. Our attention was first directed to this article in the discussion that took place in our columns on the question of boring square holes. As we showed at the time,

Novelties.—Fig. 1.—The Forstner Auger-Bit Improved.

this article can be made to produce a square hole, although not exactly in the sense that would be understood by using the term without qualification. Since our description of the tool we have had numerous inquiries for it, particularly with reference to a supply in the eastern or central portion of the country. Many of our readers will be interested in learning that this article is now being manufactured by the Bridgeport Gun Implement Co., with works at Bridgeport, Conn., and salesroom in New York City. Some important improvements in the shape and construction of the bit have been added since its manufacture was undertaken by this company, and it is in the improved form that it is now offered to the trade. It is being manufactured in all the usual sizes, both for use in ordinary braces and in machines. The bits are sold separately or in sets, as may be required. The advantages to which the makers direct attention embrace the following: The bit will not deviate for knots or cracks; it will bore equally well with or against the grain; there is no liability of the wood splitting, however close the holes bored may be; the hole produced is true and polished; it may be used to render a hole already bored oblong, oval or square; it will enter the wood at any angle, from any direction, and is claimed to be the only round bit that will bore a square hole for letting in bolt-heads. The general appearance of the tool is shown above

Combination Vise and Lathe.

A cheap and useful tool for the machine shop, for amateurs, jewelers and others is shown in the annexed cut. It is made by James R. MacMillan, 1423 North Fifty-second street, Philadelphia, Pa., and combines the slide-lathe, the drill press and the vise. It is supplied with automatic feed and can be readily worked by hand, or with the treadle, or by power. When used as a vise the nut is locked by No. 1; No. 2 is secured by the bent pin being placed in the groove; No. 3 is loosened. When used as a lathe or

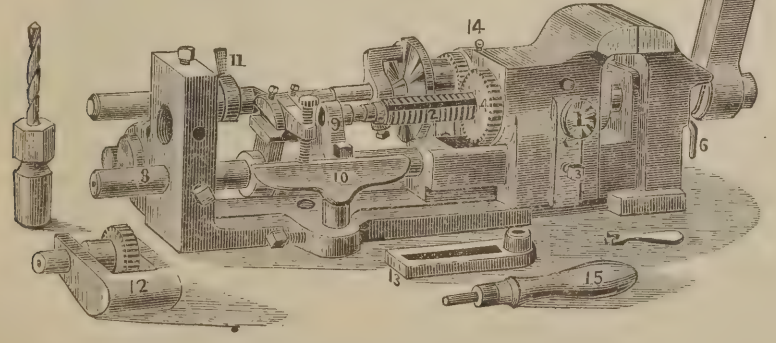


Fig. 2.—Combination Vise and Lathe for Amateurs, &c.

a drill, No. 1 is loosened, and the nut is allowed to turn with the screw. No. 4 is placed in position as seen in the cut, and acts as a driver for the lathe and feed for the drill; withdrawing pinion and connecting driver and nut prevents all feed; the feed being positive, the square-shank chuck No. 5 is preferred. It prevents all slipping of the drill and breaking by non-sensitive hands. When using the small drill the hand-screw in standard may be used to advantage. No. 7 can be slipped off and used as a wrench, and a hand-wheel substituted. No. 11 adjusts the work in centers. The latter, being stationary, gives to the work great solidity and equal wear.

New Foot-Lathe.

The Seneca Falls Mfg. Co., of Seneca Falls, N. Y., are calling attention to a New Foot-Lathe which they are just introducing

Fig. 3.—The Union Foot-Lathe, Built by the Seneca Falls Mfg. Co.

and which they have named the Union. This lathe, which they state has many new and valuable features, is intended for practical use in the workshop for turning in wood or metals; also for boring, drilling, polishing and other similar purposes. The makers direct attention to the design, Fig. 3, which shows a strong, durable and thoroughly built machine. The entire machine is of iron and steel with the exception of the stand-top, which is of hardwood neatly finished. The treadle motion is peculiar, and is claimed to be the most powerful that has ever been offered with a foot-lathe. Double treadles are employed, which makes possible a walking motion. The treadles are movable and work independent of each other. They are connected on opposite ends of the driving-wheel shaft in such a manner as to produce a strong, positive and continuous power. In addition to these advantages the tool can be started or stopped instantly, and may be operated, while sitting, with both feet; or, when standing, with one foot, as may be required. The driving-wheel is of sufficient weight for all ordinary purposes and is 26 inches in diameter. A 1-inch flat belt is used and two speeds are provided for. The headstock has a hollow steel spindle with brass boxes made adjustable to take up the wear. The tailstock has a steel screw spindle with lever and hand-wheel. The centers are fitted to Morse twist drills No. 1 taper. Two sizes of this tool are made, both with 10-inch swing, one being 24 inches between the centers, and the other 36 inches between centers. Extra attachments are also provided for use with this tool when required. Among these may be mentioned a compound slide-rest which is very desirable for working in metals. By its use straight or tapering turning may be done and work may be faced or the surfaces squared up to the full capacity of the lathe. It is provided with two slides placed at right angles with each other, carrying a tool-post which can be drawn back and forth or moved sideways by means of screws. This adjustment allows any position for the turning tool. A beveled rest is also provided which allows the vertical adjustment of the tool without altering its pitch. The cross-feed is 2 inches and the horizontal feed 6 inches. The tool-post, screws and gibs are steel, and the traverse screws are covered. A circular-saw attachment is also provided, adapting the tool for ripping, cross-cutting, mitering and the like. The table of this attachment is 15 inches long by 12 inches wide, and is provided with two adjustable guides which move in slides at right angles with each other, one of which has a mitering attachment. The table has a vertical adjustment of 2 inches. One end of the saw-arbor screws on to the head-spindle, while the other runs on a dead-center.

Pivot for Hanging Doors.

One of the displays at the Novelties Exhibition, at Philadelphia, bore the startling title of "Doors Hung Without Hinges." Fig. 4 of the engravings represents the appearance of a pair of doors arranged in

Novelties.—Fig. 4.—Doors Hung with Moyer's Pivot.

the general manner indicated. Close inspection of the model showed that, in place of hinges, pivots arranged on the general plan indicated in Fig. 6 were employed, being located in the architrave, finishing the door as shown in Fig. 5. The object of this construction, which is put upon the market by J. W. Moyer, 402 North Eleventh street, Philadelphia, is to avoid the mutilation of doors and the finish about doorways and the unsightliness of hinges. This construction also avoids an aperture between the edge of the door and the jamb when open. Another advantage to which the inventor directs attention is that this construction avoids the friction of from two to 10 or more points to each door, as is the case with the ordinary hinges in common use. He further directs attention to the fact that doors which are liable to sag when hung with hinges in the usual manner are, by the use of the pivot, fastened to the architrave, which rests on the floor in such a way as to avoid sagging. For self-closing doors there is used in connection with the pivot a concealed

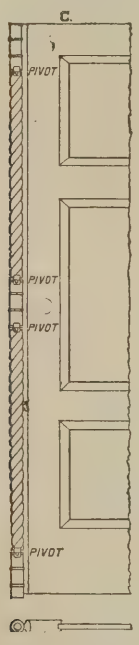


Fig. 5.—Position of Pivots in Architrave.

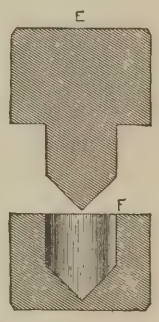


Fig. 6.—Section Through Pivot.

spring, doing away with the ill-looking contrivances sometimes used for the same purpose, and which mar the beauty of well-finished doors. The engravings very clearly show the features of this improvement.

Window Tightener.

A device for stopping the rattling of windows is being offered by B F. S. Patten & Sons, 151 Congress street, Boston. The Tightener is in the nature of a small rubber wheel or spool which is placed close against the window sash on the casing, so as to take up the slack in the sash. It is held in place by a screw, and its position is such as to cause it to be revolved freely as the sash is moved up or down. In the circular describing this article the manufacturers refer to the common experience of people living in illy-built houses, during windy seasons, of getting up nights and making wedges, or hunting for some sharp instrument to act as a wedge, to stop the noise of a rattling window, all of which they claim is avoided by the employment of this article. They also refer to the advantage of this tightener as a weather strip, inasmuch as it renders the window comparatively tight without the application of extra material.

New Shingling Bracket.

The shingling bracket shown in Fig. 7 of the illustrations, while not entirely new, so far as the general idea and construction is concerned, has recently changed hands, and is now put upon the market in a better form than ever before by a firm that is giving careful attention to the actual requirements of the trade with reference to articles of this kind. The device is known as Ryan's Improved Shingling Bracket, and is offered to the trade by Henry Brooks & Co., of No. 115 Milk street, Boston. The bracket is described as being made of wrought iron in a form to be both strong and durable. As will be gained from the engraving, it is fastened to the roof by inserting it under one course of shingles, where it is clamped by a screw and by means of two sharpened points which engage in the course of shingles at the foot. By the use of this article all nails in the scaffolding are avoided, while the adjustments are so simple as to be readily and easily performed by any one. The bed piece is so constructed that it can be inserted under the shingles without unduly spreading them or otherwise injuring them. The bed-piece is provided also with holes, so that it can be fastened by nailing to

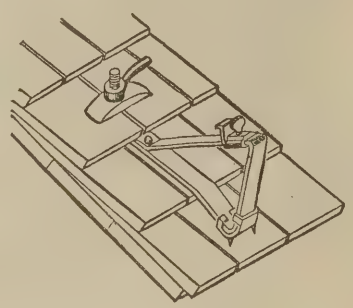


Fig. 7.—Ryan's Shingling Bracket.

roof timbers, thus adapting the bracket to use for sheeting roofs as well as for shingling them. Attached to the upper bar is an adjustable gauge which can be made to fit different widths of boards, thus securing the scaffolding firmly to the brackets.

Drinking Fountains.

Henry F. Jenks, Pawtucket, R. I., is introducing a line of Drinking Fountains intended for use on sidewalks and in parks, for both man and beast. Some of the styles are shown arranged about lamp-posts and others in connection with a special pedestal. A cold-water fountain, known in his catalogue as "No. 3," which in its exterior appearance is not unlike some others that are in use, possesses a number of notable features, rendering a description valuable to our readers. The fountain consists in an ornamental post setting on the sidewalk near the curbstone. An ice box is placed near the sidewalk underground, which is provided with coils of tin-lined pipe on which ice is placed, thus cooling the water flowing through the coils to the outlet of the fountain. This ice box has a cover which is about 12 inches below the surface of the sidewalk, while above and even with the grade of the sidewalk is a second cover made of iron held in an iron frame. These two covers, with the open space about the ice box, form an inclosure which to a certain extent excludes the heat radiating from both the earth and the atmosphere, thus saving ice that would otherwise be required. The fountain is provided with self-closing faucets, and receptacles underneath the outlets of the faucets for receiving waste water. From these receptacles the water is conducted to other fountains placed near the ground, constituting basins from which dogs and other small animals may drink. The manufacturer assures us that these fountains are constructed in a thorough manner, so as to secure durability and efficiency. Fountains are supplied both with and without the ice-box attachment, as may be desired. In the different styles of fountains put out by Mr. Jenks we are informed that special attention is given to the disposal of waste water, while the castings are made extra heavy, so as to avoid liability of breakage. The fountains are now in use in several cities and towns.

New Chimney Cap.

Two styles of a chimney cap known in the trade as the Star Foundry Chimney Cap are illustrated in the accompanying engrav-

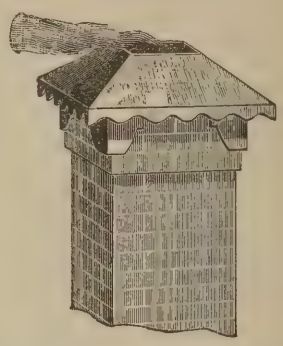


Fig. 8.—Simple Form of Cap for Single Flue.

ings. It derives its name from the source of manufacture, namely, the Star Foundry, Worcester, Mass. The Mason Regulator Co., 40 Cortlandt street, New York, are sole agents. This cap has for its object the protection and embellishment of chimney tops and the improvement of the draft of the flues. The caps are manufactured in numerous styles and sizes, fitting chimneys of either single or double flues. The cuts show two styles and illustrate the principles employed in construction. The merits claimed for this cap may be enumerated as follows. It is made of cast iron and is arranged in a series of inclined planes, so that when the wind from any point strikes one or more of the series of inclined planes, following them upward through the opening, over the mouth of the flue, it will produce a partial vacuum in the chimney and make a draft. This is illustrated by the arrows in the engraving. Down-drafts are likewise prevented. It is claimed that a down-current will promote a

Fig. 9.—Style of Cap with Three Tiers of Slate.

draft up the flue as fully as an up-current. How this is accomplished is also illustrated by the arrows. The down-current enters the mouth of the cap and passes outwardly through the slats, thus inducing a current up the flue, carrying the smoke with it. Rain, which usually falls at an angle, drops on the face of the slate, so that it is thrown chiefly on the outside and not on the inside

of the chimney The construction of the base of the ventilator is such as to cause it bind the chimney firmly on all sides and prevent undue expansion.

Blind-Slat Holder.

In Fig. 10 of the engravings we show Sturts's Blind-Slat Holder, an invention that was exhibited at the Novelties Exhibition, Philadelphia, recently closed. Fig. 11 shows the application of the device to an outside blind and indicates how it is arranged for holding the slats in any required position. Two styles of the holder are manufactured—one adapted for use with outside blinds and the other upon inside blinds It will be seen that the article consists of a strip of metal corrugated and bent somewhat in the shape of an arc of a circle. The corrugations serve as stops and thus fasten the slats as may be required. This article is being put upon the market by Amos Sturts, 15 North Twenty-third street, Philadelphia.

Novelties.—Fig. 10.—Sturts's Blind-Slat Holder.

Plasterer's Hawk.

A new article for plasterers' use is being introduced by J. Gorman, of Elizabeth, N. J. The name of the Perfect Plasterer's Hawk has been applied to it. The hawk is 13½ inches square and is of a form described as three-dovetail. It is light and substantial. Its special novelty, however, is in the handle and method of attachment. The handle is readily removed and is fastened in place by inserting and giving it a quarter-turn. The advantages are in the direction of using one handle upon any number of hawks that may be employed, and in the convenience of transportation, both upon the part of the trade dealing in

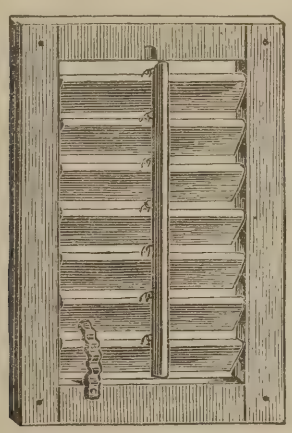


Fig. 11.—Application of Sturts's Blind-Slat Holder.

these goods and upon the part of the users in going from one building to another. We are assured that the price of these goods is so low as to bring them into competition with the most ordinary article.

New Locking Hinge.

Fig. 12 of the engravings represents a new Locking Hinge which has been recently brought out by Messrs. C. S. Osborne & Co., of Newark, N. J. This hinge is adapted for use on window blinds and is claimed to have several valuable features. The hinge is operated by the thumb-pieces at the end of the part fastening to the blind. By pressing on these parts a spring bolt is moved either backward or forward, as the case may be, which enters holes prepared for it in the disk of metal shown on the hinge, and thus locks the blind in any desired position. The whole device is simple, and, it is claimed, is not likely to get out of order. Among the advantages to which attention is directed by the manufacturers are that, with the use of this hinge, staples and other kinds of separate fastenings are not required. It is found especially advantageous for use on bay-windows and in other positions where it is difficult to fasten open

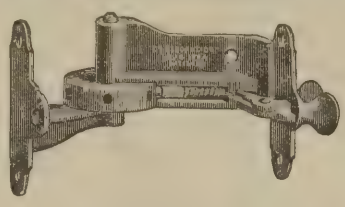


Fig. 12.—Robinson's Locking Hinge.

the blinds securely by the devices in common use. The construction of this hinge is such that it will automatically lock itself in a new position if released from one in which it has been placed.

Fire-Proof Composition Plate.

S. B. Ryder, of Elizabeth, N. J., is introducing a new Composition Plate of peculiar construction, shown in Fig 13. It is manufactured under a recent patent and adapted for walls, ceilings, hot-air flues and other places. This plate takes the place of lath, scratch coat or browning usually employed in the finish of walls of rooms. At the same time it is claimed to be fire-proof and almost as durable as stone. The plates are cast in molds and are of a composition which, when dry, is very hard, and which possesses the quality of not chipping or crumbling and not being injuriously affected by heat, cold or moisture. The plates are from 1 inch to 2½ inches thick, according to the use that is to be made of them, and are of length and width to suit the distances between the beams or studding with which they are used. They are fixed between the beams or studs in lieu of lath and plaster, as already mentioned. They are fastened by nails driven through the ends of metal strips which are inserted in the plates in the process of molding. This construction leaves one-half of the thickness of the blocks projecting from the face of the support. The spaces between these plates are then filled up even with their face with the same material. The composition keys into the hollows cast into the edges of the plates, and, hardening, fastens the individual parts together. Among the advantages referred to by the manufacturer are that the plates, being placed between the beams, brace and strengthen the framework of the building. It is asserted that a ceiling made in this manner of plates 1 inch thick will support the weight of a man. After the plates have been put in place as we have described, the wall or ceiling, as the case may be, is ready for hard finish, painting or papering without the necessity of delay for drying. From the nature of the plates and their construction there is no danger of cracks appearing. In addition to the general utility of the plates as above described, and their broad application to buildings in general, there are special uses to which the maker directs attention. They are of great utility in building dryrooms for lumber and various other materials. They have the advantage, while being fire-proof, of also being excellent non-conductors. Attention is also directed to the fact that these plates are superior on account of deadening sound.

Protecting Show Windows from Frost.

The Utica Steam Gauge Co., of Utica, N. Y., are introducing a patented system of window heating which is said to afford entire protection against the obscuring of show-windows by frost in winter. The cause of the trouble is well known. The moist, warm air from within comes in contact with the cold glass and is quickly cooled. This cooling causes it to deposit its moisture on the cooling surface and ice at once forms. The inventors of the system under consideration claim to have determined the fact by experiment that if the moist, warm air in the room can be kept from contact with the glass no ice can form. To accomplish this they introduce a current of warm, dry air at such a point that it is forced up along the face of the glass, reversing or deflecting inwardly the current of moist air which, in falling along the glass, would deposit its moisture by condensation. How this end is attained is shown in the accompanying diagram, Fig. 14. Outside air is admitted under the window and falls, as cold air naturally will, to the box containing the steam-pipes.

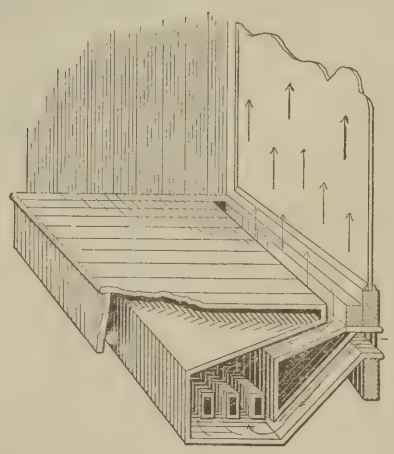


Fig.—14 — Steam-Heated Show Window.

Here it is heated, and, displaced by the cold air of greater specific gravity, it rises to the point of discharge along the bottom of the window. In obedience to the law of nature it rises along the glass, obviously losing some of its heat, but probably not enough to check the ascending current. At the ceiling it turns and rolls inward, and if cooler than the air of the room it will fall until the equilibrium due to uniformity of temperature is reached. This reverses the current usually found established along the inside surfaces of show and other windows. This system is covered by the patents of E. A. Wood. During cold weather, and especially in the higher latitudes, the obscuration of store windows by frost is a serious annoyance to business men in all lines of business. It results largely from the condensation of the vapor of water thrown off by the gas or kerosene used for illumination, and cannot be prevented by interposing an inside glass partition between the store and the shop-windows unless the lighting is effected by outside lights, so placed as to reflect their rays into the window through the glass. This accomplishes the purpose sought, but is not in all respects desirable, as the illumination by means of outside reflectors is never as bright and cheerful as from inside lights.

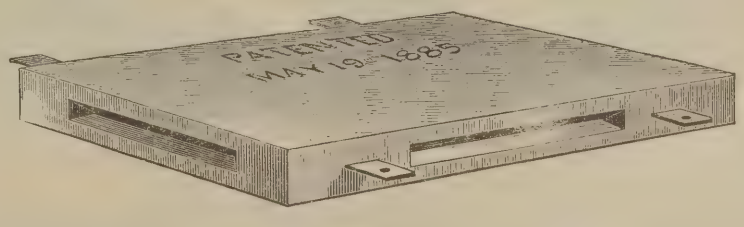
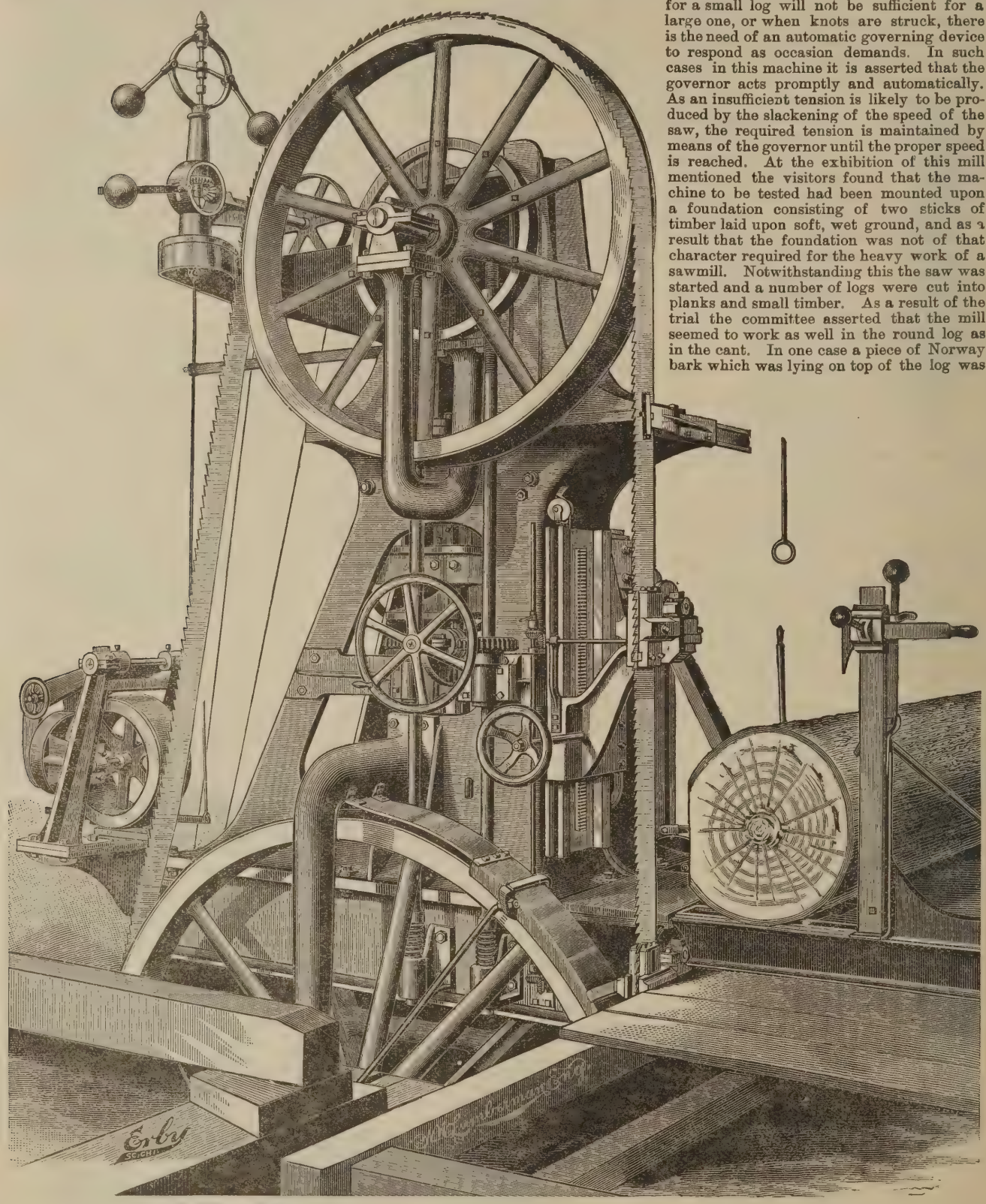


Fig 13.—Mitchell's Fire-Proof Composition Plate.

New Band Saw Mill.

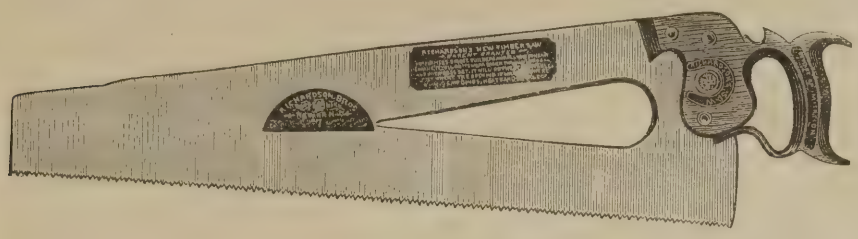
Below is shown a new Band Saw Mill built by Benjamin & Fischer, Chicago, which possesses features of interest to lumbermen and wood-workers in general. Many attempts have been made in the construction of sawmills utilizing the band-saw principle, but all that have appeared in the past have left opportunities for improvement. The device which we illustrate is one of the most recent attempts toward perfecting a mill of the character mentioned, and that it has merits of no mean order is fully attested by the results of a trial made under the auspices of the Lumbermen's Association, in September last. Among the peculiarities of this machine may be mentioned the relatively small diameter of the upper wheel, which decreases the bearing surface at this point while increasing it at the driving point or on the lower and larger wheel. A tightening-wheel is also introduced at a point where the saw leaves the driving-wheel, intended for taking up the slack of the idle side of the saw, thus obviating the necessity of so intense a strain as is sometimes found necessary. A governor is also provided, the location of which is shown in the engraving. In sawmills of this class as ordinarily constructed the top and bottom pulleys are of the same size, but in this case, the upper pulley being the smaller, the governor operates to prevent it from becoming the driver, thus overcoming the tendency to buckle which would otherwise exist. The governor is run on a friction-wheel, resting on the saw blade at its highest point. If from any cause the speed of the saw slackens, the balls of the governor drop and raise a brake which, coming in contact with wheel inside of the upper wheel and attached to it, instantly checks its velocity, at the same time exerting a powerful leverage upon the tightening-wheel, serving to tighten the saw and keep the slack where it belongs. Another purpose is also served. Inasmuch as the tension of the saw suitable for a small log will not be sufficient for a large one, or when knots are struck, there is the need of an automatic governing device to respond as occasion demands. In such cases in this machine it is asserted that the governor acts promptly and automatically. As an insufficient tension is likely to be produced by the slackening of the speed of the saw, the required tension is maintained by means of the governor until the proper speed is reached. At the exhibition of this mill mentioned the visitors found that the machine to be tested had been mounted upon a foundation consisting of two sticks of timber laid upon soft, wet ground, and as a result that the foundation was not of that character required for the heavy work of a sawmill. Notwithstanding this the saw was started and a number of logs were cut into planks and small timber. As a result of the trial the committee asserted that the mill seemed to work as well in the round log as in the cant. In one case a piece of Norway bark which was lying on top of the log was cut by the saw without in the least disturbing its position. The feed employed was 5 inches, and the saw is said to have done its work with a steady motion and that musical ring so sweet to the ears of practical millmen. We learn from the manufacturers that this mill has a capacity of from 30,000 to 40,000 feet of lumber per day, a result which, it is claimed, has never been reached by other band saw mills.



Novelties.—Band Saw Mill, Built by Benjamin & Fischer, Chicago, Ill.

Improvements in Saws.

Messrs. Richardson Bros., of Newark, N. J., proprietors of Richardson's Saw Works, are directing attention to some recent improvements which they have made in Saws. One of these is indicated in Fig. 16 of the accompanying engravings, and has the novelty of a large perforation or opening cut in the blade near the handle. Surplus metal has been removed from the blade at this point for the purpose of lightening the saw and lessening the liability to heat or buckle at the place where such difficulty ordinarily occurs. The makers recommend it to the use of framers, bridge builders and all who do heavy sawing, on account of its working easier than a solid saw. In addition to this novel feature the saw described has all the characteristics of good workmanship and careful finish which are peculiar to the saws of the establishment named.



Novelties.—Fig. 16.—Improvements in Saws.—Richardson's New Timber Saw.

Combined Sheeting and Lath.

Fig 17 of the engravings represents Byrkit's Combined Sheeting and Lath, which is being manufactured by the Byrkit Sheeting and Lath Co., of Indianapolis, Ind. This article consists of sheeting boards worked on one side with dovetailed grooves forming a clinch for the plaster, and on the opposite side with parallel kerfs intended to overcome the liability of cracking and warping. It is manufactured 4 inches in width and of various lengths, the same as flooring. We learn from the makers that it is produced on a machine found in every planing mill, with the assistance of a simple attachment, and, further, that it is made with a single handling of the board. By its use every wall partition and ceiling in the house is made solid, thus adding great strength to the building and securing a plaster finish on the inside. The makers claim for it that it renders a house warmer, stronger and better in every way, while at the same time it is cheaper. Further, they say that it has been determined by experiment that there is no danger of plaster cracking and coming off, as with ordinary lath. It is also useful for employment as outside sheeting in cases where back plastering is to be done. The characteristics of the article are very clearly shown in the engraving. We understand that it is furnished at the same price per thousand as ordinary matched sheeting.

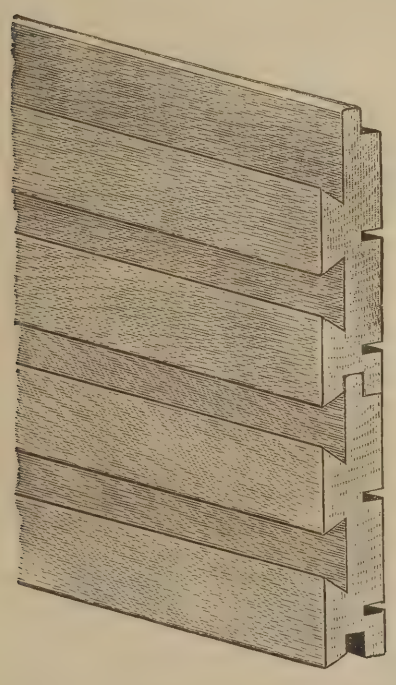


Fig. 17.—Byrkit's Combined Sheeting and Lath.

Reversible-Spring Window-Bolt.

Messrs. W. B. Woodman & Co., of Nos. 10 and 12 Ward street, Newark, N. J., are manufacturing and putting upon the market the Reversible-Spring Window-Bolt shown in Fig. 18. This article is designed to take the place of bolts of a somewhat similar character that have been in the market for some time past. Instead of working in a ferrule or hole in the window-stop, the bolt comes in contact with a square-headed screw which projects from the stop sufficiently for the purpose. The end of the bolt is beveled, so that when it is turned one way the window can be raised or lowered, as the case may be, without attention to the bolt. Turning it in the opposite direction permits the window to be moved in the opposite direction in the same general mannor, while without turning the window is fastened either up or down. This construction has certain advantages to which the makers direct attention. In order to close a window after it has been raised, it is necessary to turn the bolt in the direction that will lock the window down when it is closed. On the other hand, for the purpose of opening the window the bolt must necessarily be turned in the direction to constitute it a stop for holding it up. The bolts are used upon both upper and lower sash. In order to facilitate passing, a portion of the rail is cut from the lower sash and fastened to the bottom rail of the upper sash, thus allowing space for the bolt and insuring a close-fitting sash when shut. This article is finished in several styles, including nickel-plated and bronzed.

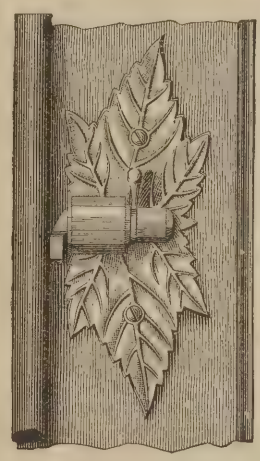


Fig. 18.—Reversible-Spring Window-Bolt.

In the northeast corner of the machinery department of the American Institute Fair the third-grade boys of Grammer School 57, of this city, have placed on exhibition a very ingenious and interesting collection of models made by themselves to illustrate the work of their grade. The young mechanics are all under 14 years of age, and this is the first time they have placed any work on public exhibition. Their class teacher is J. Abdon Donnegan. The space allowed to the exhibits is about 7 feet square, and the written notices not to touch the models are clearly necessary, for an inquisitive person with a long arm would find no difficulty in fingering the furtherest of them. They are intended to illustrate the six mechanical powers, and among them are a dumb waiter about 3 feet high, made by Everett Thompson, showing how the pulley works; a derrick nearly the same hight, the work of Henry P. Stoeker; a foundry crane made by Charles Chase; a pump and an elevator.

NEW PUBLICATIONS.

LECTURES ON THE PRINCIPLES OF HOUSE DRAINAGE. Delivered before the Suffolk District Medical Society, and the Boston Society of Architects, at the Massachusetts Institute of Technology, by J. Pickering Putnam. Size 5 x 7½ inches, 125 pages, bound in cloth. Published by Ticknor & Co. Price 75 cents.

The lectures which form the basis of this book were delivered some time since, and in the interval have been published in one of the medical journals, and from it copied into several different sanitary and plumbing papers, both domestic and foreign, including the London *Sanitary Record*. In the first lecture the speaker calls attention to the fact that a number of the appliances which are used for illustration are inventions of his own, and that some of them are patented. These devices are marked in the cuts with their name, "Sanitas." From the care with which these particular inventions are described and the different steps explained which led up to their conception, it would appear that the speaker had in view as a prime object in the lectures the advertising of these specialties. After what has already appeared in our columns with reference to the Sanitas trap, it is scarcely necessary to state that the drift of the remarks, so far as traps are concerned, is against ventilation. The second lectures has for its subject wash-basins, bathtubs, slop-sinks and laundry-tubs. The next lecture takes up the question of water-closets and urinals. Following this is a consideration of soil and drain pipes, while the last topic considered is the size and general arrangement of piping in a house.

MOLDERS' TEXTBOOK. By Thomas D. West. Size, 5 x 7¾ inches, 461 pages. Published by John Wiley & Sons. Price, $2.50.

Mr. West's new book is a continuation of his work on "American Foundry Practice," which was brought out about two years ago, and, together with that volume, embraces a comprehensive treatment of the subject. Cupolas and melting and also molding in green sand, in dry sand and in loam are treated of at length in the new volume, and an interesting chapter on cranes is added. The practical and essential features to be considered in properly constructing cranes for foundry use are presented, and jib, post and traveling cranes are treated, so that ideas of practical value may be obtained. Throughout thorough familiarity of the author with the subjects in hand is apparent, making the book one of great practical value.

THE WORLD'S LUMBER-ROOM; A GOSSIP ABOUT SOME OF ITS CONTENTS. By Salena Gaye. Size 5x7½ inches, 316 pages, 57 illustrations. Published by Cassel & Co. Price $1.50.

The object of this volume has been to give in popular form an account of some of the many ways in which refuse is made and disposed of, first, and chiefly, by nature, and, second, by man. "The World's Lumber-Room" is considered in three great departments, namely, earth, air and water. It is, in fact, coextensive with the world itself, and may be described as a workshop or laboratory where nothing is left to perish. Some of the chapter headings are suggestive and will give an idea of the scope of the book. The first is "Dust;" the second and third, "Dust Makers," in which frost and heat, wind and waves, are considered. "Dust Carriers" are then considered, including running waters, glaciers and icebergs. The sixth and seventh chapters again take up the subject of "Dust

Makers," introducing earthquakes and volcanoes, vegetables and animals. In the chapters following, the question of "What Becomes of the Dust," is discussed. "Vegetable Scavengers" forms the title of the eleventh chapter, while "Animal Scavengers" is treated in the three chapters following. "Household Refuse" is the title of one of the closing chapters, and "Miscellaneous Refuse" another. The work is popular in its method, and many interesting facts are presented in a very attractive manner. The book is well adapted to interest the young and inquiring mind.

MODERN MOLDING AND PATTERN-MAKING. By Joseph P. Mullin. Size 5 x 8 inches, 257 pages. Published by D. Van Nostrand. Price, $2.50.

Mr. Mullin supplies his readers with the results of many years of careful study and experience in the different branches of molding and pattern-making, and while the book might have been improved in several directions, notably in the line of engravings, it will no doubt prove of value to many. The author has followed every piece in detail from the drawing-room to the finished casting ready for the machinist, and his suggestions and methods are thoroughly practical. The book embraces in all 24 chapters, together with tables of weights and measures, miscellaneous recipes and tables, decimal equivalents and practical tables for general use.

THE PRESERVATION OF TIMBER BY THE USE OF ANTISEPTICS. By Samuel B. Boulton. Size 3¾ x 6 inches, 238 pages. Published by D. Van Nostrand. Price, 50 cents.

The matter contained in this book was originally presented to the British Institution of Civil Engineers in a paper read by Mr. Boulton, a fact which is a sufficient guarantee that it supplies particulars best worth knowing now in the possession of practical men. Starting with a short account of the history and development of the use of antiseptics for preventing the decay of timber, the author refers at some length to the different processes employed, and adds results derived from many years' experience, together with the outcome of some research and a number of experiments especially undertaken with a view to the elucidation of questions bearing on the subject. The greater part of the book (138 pages) is given up to a discussion of the paper, supplying a large amount of interesting particulars resulting from individual experience and research.

TRADE NOTES.

MESSRS. GUMMEY, SPERING, INGRAM & Co., of Philadelphia, made a very handsome display of the Patten sheet metal shingle at the Novelties Exhibition recently closed. The shingles were shown applied to a miniature house having porch, projecting bay-windows and gables. The building was a fair type of many modern residences, and the shingles with which it was roofed showed to marked advantage. An engraving of this house has been made and ornaments the front page of a circular describing these goods which the firm is mailing to its customers. The Patten shingles received the first premium at the exhibition.

THE UNITED STATES ENCAUSTIC TILE CO., Indianapolis, Ind., send us copies of recent circulars describing their product and containing their revised price list referring to the catalogue, which we noticed some time since. One of the circulars presents a view of the works, which are at present operated by J. L. Mothershead as receiver. A list of prominent buildings in which these tile have been used is also appended. The buildings mentioned are distributed among the important towns of the country.

WE HAVE RECEIVED from Bakewell & Mullins, Salem, Ohio, large photographs of a statue of Liberty which they have recently completed. The work differs in some respects from the conventional figure bearing this name, and in all particulars is superior in design and execution to the ordinary run of sheet-metal statuary. There is a better pose to the figure, more artistic quality to the features and a more natural draping. The use of sheet-metal work in the way of emblematic figures and for the decoration of public buildings is on the increase, and it is to the interest of the public that the quality of the work produced should also be improving.

AT THE NOVELTIES EXHIBITION, Philadelphia, Walter's metallic shingles, made by the National Sheet Metal Roofing, Co., New York, were prominently displayed on an attractive house which had been built for the purpose. The shingles were used upon the roofs and sides of a building, some of them being of tin painted, others being unpainted, while a portion of the surfaces were covered with copper shingles. Different sizes were employed, so as to show the goods to advantage.

CORDESMAN, MEYER & Co., 133 West Second street, Cincinnati, send us a number of circulars illustrating wood-working machinery of their manufacture. Several styles of band-saws are illustrated, also an iron-frame swinging cut-off saw, universal rip and cross-cut saw, and a 24-inch surface planer. All of these tools have special features to which attention is directed in the accompanying letter-press.

SEBASTIAN MAY & Co., of 169 West Second street, Cincinnati, Ohio, send us a copy of their illustrated catalogue and price list of foot and power lathes, drill presses, chucks, drills, amateur supplies and small steam engines. Their pamphlet is profusely illustrated with engravings of such tools as are frequently required in workshops in almost every line of trade, and which at the same time are often difficult to obtain from lack of information of where they are manufactured. One of the leading tools illustrated and described is a screw-cutting lathe, swinging 8 x 20 inches, which operates by foot-power, and which is sold at a very low price. It is specially adapted to the use of model-makers, inventors, amateurs and others. A back-geared screw-cutting lathe is also shown, likewise wood-turning lathes, bench drill presses and various patterns of chucks, together with a wide range of small tools. The engines referred to are 2 and 4 horse-power, and in appearance and design are novel. The boiler is set at an inclination, the engine being attached to the outside. The front of the boiler very much resembles an ordinary stove, the grate-bars being in sight, while at the same time it is mounted on a truck, thus adapting it for removal or transportation from place to place. It is supported by the two wheels of the truck and a braced framework at the back. The 4 horse-power engine and boiler occupy a floor space of 30 x 54 inches and a hight of 5 feet.

JOHN S. LOOMIS, whose planing mill is located at the corner of Baltic and Nevins streets, Brooklyn, N. Y., sends us a copy of his catalogue of moldings, scrollwork, newels, balusters, church work, stair-rails, &c., bearing date 1885. A very large number of designs is contained in this work, many of which are of special excellence. A large variety of panels, sawed balusters and ornamental verge-boards contained in the catalogue are deserving of special mention.

WE HAVE RECEIVED a prospectus of the Northwestern Permanent Exhibit, Builders' and Mechanics' Exchange, located at Minneapolis, Minn. This organization proposes to keep its room open free to the public every business day of the year from 8 in the morning to 10 at night. Articles of interest to architects, builders and house owners are to be exhibited in space that may be rented for the purpose, and will be in charge of attendants, who are to answer questions, supply circulars, &c. The room in which this permanent exhibit is to be located is occupied by the State Architectural Association, the Builders' Association, the Plumbers' Association and the Mechanics' Club for their meetings. From this it would seem that whatever goods are displayed will be brought to the attention of a number of those whom it is most desirable to interest. The floor plan which accompanies the prospectus shows the arrangement of the room and the facilities afforded. A feature of the enterprise is a library and reading-room, with post-office boxes, telephone connections, messenger boys, all at the disposal of the visitor, architect, contractor, material dealer, &c.

THE NEW YORK LUMBR AND WOOD WORKING CO., with office and factory at 134th steet and Alexander avenue, this city, send us a copy of a new catalogue devoted to corner blocks, square turned balusters, round and carved balusters, solid square, round, turned and built-up newels, polished square turned spindles, stair-railing and other specialties. This company some time since purchased the entire plant of the New York Wood Working Co. and have added machinery for the manufacture of doors, sash, blinds, cabinet-work, mantels and interior finish of all kinds. They claim to have a factory in equipment and capacity second to none in the city.

THE SECOND CONVENTION of the Western Association of Architects was held in St. Louis November 18 to 20, inclusive. A feature of this convention was an exhibition of architectural drawings which attracted deserved attention. The meeting had a fair attendance and all the exercises were participated in by the members present with great interest and apparent profit.

WE LEARN FROM the Egan Co. that they have recently designed a new band saw mill with 8-foot wheels, possessing new features calculated to give the machine great strength. This machine has been designed as an improvement over the band saw mills heretofore put out by this company, of which 100 are in use. The item is of interest to all who are contemplating the purchase of machinery of this character.

WE HAVE RECEIVED a very handsome illustrated catalogue of special wood-working machinery, issued by Seymour Whitlock, 43 Lawrence street, Newark, N. J. Among the articles illustrated and described are upright sash dovetailing machines, complete dovetailing machines, scroll-saws, saw-tables. foot-power mortising machines, blind-slat wiring machines, last-turning machines, foot and hand mitering machines and Whitlock engines.

THE COILED WIRE BELT CO., 93 Cliff street, New York, are calling attention to a line of goods which were illustrated in our department of "Novelties" some time since. They are manufacturing sash cords made of coiled wire; also coiled wire belting adapted to use on light machinery of all kinds, and a coiled wire door spring very simple in its construction and easily applied under almost all conditions. This line of goods exemplifies in a marked degree the diversified applications of wire in modern manufactures. A special advantage of the sash cords constructed of this material is that the slight spring which they afford counteracts the tendency to break on the sudden stopping of the window either up or down. This feature adds greatly to the durability of the cords.

IN A RECENT circular issued by I. P. Frink, of 551 Pearl street, New York City, attention is directed to the Ideal light for churches, concert-rooms, picture galleries and other similar places. Something is required that is at once brilliant and yet avoids the objections pertaining to the gaudy glare of calcium lights, and which is also free from the flickering flame of the ordinary gas-burner. What is wanted is described as a soft, dreamy, transparent brilliancy, which shall illumine every part of a vast audience-room and still not be objectionable to sensitive eyes. Something is desired which shall penetrate to the most distant corner, hunting out the lurking shadows, as well as rounding up the graceful curves of architectural features, giving added luster to the decorator's skill and revealing new beauties of the artist's brush. Mr. Frink claims that these various requirements are satisfactorily met by the use of the reflectors which he is supplying, and which are varied to suit all styles of architecture and adapted for use under all circumstances. An illustrated circular is sent upon application.

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